

About This Manual

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- the electrical installation of the relevant room complies with the applicable national and local requirements; and
- the product is used in accordance with the instructions for use.

Documentation

SonoScape provides the documentation consisted of various manuals:

- Basic User Manual (this manual) describes the basic functions and operating procedures of the system.
- Advanced User Manual provides information about the measurements and calculations available in each mode.
- Compact Disc (CD) provides the acoustic output data related to the system.

Signal words in this manual are defined as follows. Please understand their meanings clearly before reading this manual.

Signal Word	Meaning
 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in malfunction or damage of the system.
NOTE	Indicates precautions or recommendations that should be used in operating the system.
	Indicates a potentially biological hazardous situation which, if not avoided, may result in disease transmission.
Boldfaced Word	Indicates keys and controls located on the control panel, or on-screen objects such as menu items or keys.

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Contents

Chapter 1 Safety	1
1.1 Intended Use.....	2
1.2 Safety Precautions	2
1.2.1 Electrical Safety.....	2
1.2.2 Mechanical Safety.....	4
1.2.3 Accessories Caring.....	4
1.2.4 Biohazard Considerations	5
1.3 Acoustic Power Principle	5
1.3.1 Biological Safety.....	5
1.3.2 ALARA.....	5
1.3.3 Mechanical and Thermal Indices	6
1.3.4 Probe Surface Temperature Limits	7
1.3.5 Imaging Functions that Change Acoustic Output.....	7
1.4 Safety Symbols.....	7
Chapter 2 System Overview.....	11
2.1 System Configuration.....	12
2.2 Physical Specifications.....	12
2.3 System Components.....	13
2.3.1 Front Panel.....	14
2.3.2 Side View	15
2.3.3 Rear Panel.....	16
2.3.4 Battery Compartment.....	17
2.3.5 Control Panel	18
2.3.6 Basic Screen.....	23
Chapter 3 Preparing the System.....	25
3.1 Positioning the System	26
3.2 Powering on the System.....	26
3.2.1 Using the Mains Supply.....	26
3.2.2 Using the Battery	26
3.2.3 Assembling/Disassembling the Battery	28
3.2.4 Status Indicator	29
3.3 Powering On/Off the System	29

3.4	Adjusting the System.....	30
3.5	Connecting the Probe	30
3.6	Connecting the Peripheral Device.....	31
3.6.1	Connecting the Footswitch	31
3.6.2	Connecting the Video Printer.....	31
3.6.3	Connecting the Network Printer	32
3.6.4	Connecting the USB Printer	33
Chapter 4	Customizing Your System	35
4.1	General System Settings.....	37
4.1.1	General Settings	37
4.1.2	Display Settings	39
4.1.3	Storage Settings	40
4.2	Peripheral Device Settings	41
4.3	Measurement Settings	42
4.3.1	General Settings.....	42
4.3.2	Measurement Menu Settings	44
4.3.3	Calculation Formula Settings.....	45
4.4	Configuring DICOM.....	47
4.4.1	Storage Service Settings	47
4.4.2	Commitment Settings	48
4.4.3	DICOM Worklist Settings.....	49
4.4.4	MPPS Settings	51
4.4.5	Print Service Settings.....	52
4.5	Defining System Defaults	54
4.6	Viewing System Information.....	55
Chapter 5	Preparing for an Exam	57
5.1	Acquiring Patient Information.....	58
5.1.1	Beginning a New Patient	58
5.1.2	Retrieving Archived Information.....	60
5.2	Using DICOM Worklist	61
5.3	Pausing/Ending an Exam	61
5.4	Completing/Discontinuing an Exam	61
5.4.1	Completing an Exam	61
5.4.2	Discontinuing an Exam.....	62
Chapter 6	Acquiring Images	63

6.1	Selecting a Probe and an Exam Type	64
6.2	Acquiring B-Mode Images	66
6.2.1	Entering B Mode	66
6.2.2	Optimizing B-Mode Images	67
6.2.2.1	Gain	67
6.2.2.2	TGC	68
6.2.2.3	Focal Position/Number/Span	68
6.2.2.4	Depth	68
6.2.2.5	Frequency	69
6.2.2.6	Chroma	69
6.2.2.7	Compound Imaging	69
6.2.2.8	Line Density	69
6.2.2.9	Persistence	69
6.2.2.10	Dynamic Range	70
6.2.2.11	Grayscale Curve	70
6.2.2.12	Adaptive Image Fusion	70
6.2.2.13	Sector Position/Width/Angle	70
6.2.2.14	Power	70
6.2.2.15	Tissue Acoustic Characteristics	71
6.2.2.16	Image Rotation	71
6.2.2.17	μScan	71
6.2.2.18	Trapezoidal Imaging	72
6.2.2.19	Steer	72
6.3	Acquiring Color Flow Images	72
6.3.1	Color Mode	72
6.3.2	DPI Mode	73
6.3.3	TDI Mode	74
6.3.4	Optimizing Color/DPI/TDI Mode Images	76
6.3.4.1	Gain	76
6.3.4.2	Frequency	76
6.3.4.3	Wall Filter	76
6.3.4.4	Pulse Repetition Frequency	76
6.3.4.5	Line Density	77
6.3.4.6	Baseline	77
6.3.4.7	Color Map	77

6.3.4.8 Persistence.....	77
6.3.4.9 Sector Position/Width/Angle.....	78
6.3.4.10 Power	78
6.3.4.11 B Reject.....	78
6.3.4.12 Steer	79
6.3.4.13 Flow Invert.....	79
6.4 Acquiring M-Mode Images	79
6.4.1 M Mode.....	79
6.4.2 Anatomical M-Mode.....	81
6.4.3 Optimizing M-Mode Images	82
6.4.3.1 Gain.....	82
6.4.3.2 M Process	82
6.4.3.3 Sweep Speed	82
6.4.3.4 Chroma.....	83
6.4.3.5 Display Format.....	83
6.4.3.6 Power	83
6.4.3.7 Video Invert.....	83
6.5 Acquiring Spectral Doppler Images	83
6.5.1 PW Mode	84
6.5.2 CW Mode.....	85
6.5.3 Optimizing Spectral Doppler Images	87
6.5.3.1 Gain.....	88
6.5.3.2 Pulse Repetition Frequency	88
6.5.3.3 High Pulse Repetition Frequency	88
6.5.3.4 Baseline.....	88
6.5.3.5 Wall Filter.....	89
6.5.3.6 Frequency.....	89
6.5.3.7 Sweep Speed	89
6.5.3.8 Power	89
6.5.3.9 Chroma.....	90
6.5.3.10 Dynamic Range.....	90
6.5.3.11 Display Format.....	90
6.5.3.12 Flow Invert.....	90
6.5.3.13 Video Invert.....	90
6.5.3.14 Angle Correction.....	91

6.5.3.15 2D Refresh	91
6.6 Acquiring Triplex-Mode Images	91
6.6.1 B+Color/TDI +M.....	91
6.6.2 B + Color/DPI/TDI + PW	93
6.6.3 B+Color/DPI+CW	94
Chapter 7 Using 3D.....	95
7.1 Acquiring 3D Images	96
7.2 Working with 3D Images.....	98
7.2.1 Setting Display Format	98
7.2.2 Reviewing Cine.....	98
7.2.3 Setting Render Mode	98
7.2.4 Cropping Reviews by ROI.....	99
7.2.5 Cropping Reviews by the Trace	100
7.2.6 Moving/Rotating/Magnifying Images	100
7.2.7 Optimizing 3D Image	101
7.2.8 Observing Reviews by the Plane	101
7.2.9 Observing Reviews by the Slice	102
7.2.10 Setting the Sweep Angle	103
7.2.11 Setting the Scan Method	103
7.2.12 Adjusting Z Angle/Z Scale.....	103
7.2.13 Restoring the Image	103
Chapter 8 Using 4D.....	105
8.1 Acquiring 4D Images	106
8.1.1 Entering the Real-Time 4D Imaging.....	106
8.1.2 Acquiring Dynamic 3D Image.....	108
8.2 Working with 4D Images.....	108
Chapter 9 Working with Images.....	109
9.1 Imaging Features	110
9.1.1 Imaging Reverse	110
9.1.2 Splitting Display	110
9.1.3 M-Tuning	112
9.1.4 Tissue Harmonic Imaging	112
9.1.5 Panoramic Imaging.....	112
9.2 Magnifying an Image	115
9.3 Freezing an Image	115

9.4 Using Cine	115
9.4.1 Reviewing Cine	115
9.4.2 Cutting Cine	116
9.5 Annotations and Body Marks	116
9.5.1 Annotating an Image with Typed Words	116
9.5.2 Annotating an Image with Arrows	117
9.5.3 Body Mark	117
9.5.4 Deleting Annotations and Body Marks	117
9.6 Using ECG	118
9.6.1 Basic Procedures of ECG Operation	118
9.6.2 Optimizing Parameters	119
9.6.3 Reviewing ECG	119
Chapter 10 Managing Images/Data	121
10.1 Storing an Image	122
10.1.1 Storing an Image Automatically	122
10.1.2 Storing an Image Manually	122
10.2 Viewing the Image/Cine	123
10.2.1 Viewing the Current Image/Cine	123
10.2.2 Retrieving an Image	124
10.3 Backing up Data	124
10.3.1 Backing up Data to the USB Device	124
10.3.2 Backing up Data to DVD	124
10.4 Importing Data to the System	125
Chapter 11 Working with DICOM	127
11.1 Verifying Connectivity	128
11.2 DICOM Storage	128
11.3 DICOM Print	128
11.4 DICOM Worklist	129
11.5 MPPS	130
11.6 Storage Commitment	131
11.7 DICOM Queue	132
Chapter 12 Probes and Biopsy	133
12.1 Probe	134
12.1.1 Available Probes	134
12.1.2 Probe Usage	135

12.1.3	Cleaning the Probe.....	136
12.1.4	Disinfecting or Sterilizing the Probe	137
12.1.5	Sterilizing the Probe.....	139
12.1.6	Disinfecting and Sterilizing the Probe Cable.....	139
12.1.7	Storage and Transportation	140
12.2	Biopsy.....	141
12.2.1	Available Biopsy Brackets	141
12.2.2	Assembling the Biopsy Bracket.....	143
12.2.3	Preparing for a Biopsy	145
12.2.4	Verifying the Biopsy Bracket.....	145
12.2.5	Performing a Biopsy	146
12.2.6	Cleaning the Biopsy Bracket	146
12.2.7	Sterilizing the Biopsy Bracket	146
12.2.8	Storage	147
Chapter 13	System Maintenance.....	149
13.1	Cleaning the System.....	150
13.2	Maintenance Checks	151
13.3	Troubleshooting.....	152
13.4	Equipment Disposal	152
13.5	Customer Service	153
Appendix A	Specifications.....	155
Appendix B	EMC Guidance and Manufacturer's Declaration	156
B. 1	Electromagnetic Emissions.....	156
B. 2	Electromagnetic Immunity	157
B. 3	Recommended Separation Distances between Portable and Mobile and RF Communications Equipment and the Equipment	159
Appendix C	Acoustic Output Data	160

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Chapter 1 Safety

This chapter describes the important information for operating this ultrasound system. To ensure the safety of both operator and patient, please read the relevant details in this chapter carefully before using this system.

You should be thoroughly familiar with the precautions provided in this manual. Otherwise, the manufacturer is not responsible for the effects on safety, reliability and performance of the ultrasound system.

1.1 Intended Use

The ultrasound system is intended for the following applications: Fetal, Abdominal, Pediatric, Small Parts (breast, testes, thyroid), Cephalic(neonatal and adult), Trans-rectal, Trans-vaginal, Peripheral Vascular, Musculo-skeletal (Conventional and Superficial), Cardiac (neonatal and adult), OB/GYN and Urology applications.

The ultrasound system also provides the measurement and calculation packages used for clinical diagnosis purposes. For details, please refer to Advanced User Manual.

Contraindication: The ultrasound system is not intended for ophthalmic use or any use causing the acoustic beam to pass through the eye.



WARNING

Precautions must be considered in the use of any application. Otherwise, it may result in system damage or serious injury.

1.2 Safety Precautions

Read and understand all precautions in this manual before attempting to use the ultrasound system. Keep this manual with the ultrasound system at all times. Periodically review the procedures for operation and safety precautions.

1.2.1 Electrical Safety



WARNING

- Only qualified physicians or sonographers can perform ultrasound scanning on human subjects for medical diagnostic reasons.
- Any unauthorized personnel should not tamper with the main unit of this system.
- Do not operate this system in an atmosphere containing flammable gases or liquids such as anesthetic gases, hydrogen, and ethanol, because there is danger of explosion.
- Do not use this system around the strong electric field, the strong electromagnetic field and the devices which generate radio waves, such as the radio, cellular telephones, transceivers. Using the system in the improper environment may result in malfunction or damage.
- Do not use this system at the same time with other equipment such as electric knife, high-frequency therapy equipment and defibrillator. Otherwise, there is a danger of electric shock.
- Connect the earth conductor only before powering on the system. Disconnect the grounding cable only after powering off the system. Otherwise, there is a danger of electric shock.
- Ensure the potential-equalization lead wire is connected before inserting the equipment power plug.

- The AC power connector plug for the ultrasound system is a three-prong grounded plug and should never be adapted to any two-prong outlet or by using an adapter. The AC power connector plug should be plugged into a hospital-grade power outlet
- Select the qualified multi-socket outlet with protective grounding, and ensure its maximum output power does not exceed the required one of this system.
- The multi-socket outlet can only be used to provide power to the recommended peripheral devices of this system.
- Do not place the multi-socket outlet on the floor.
- Do not connect other devices to the multi-socket outlet; otherwise, the rated output power may be exceeded and failure may be resulted.
- The video printer should be connected to the specific interface using the cable provided by the manufacturer; Otherwise, there is a danger of electric shock.
- Accessory equipment connected to the analog and digital interfaces must be certified according to the respective EN/IEC standards (for example, EN/IEC 60950 for data processing equipment and EN/IEC 60601-1 for medical equipment). Furthermore, all configurations shall comply with the system standards EN/IEC 60601-1-1.
- In the environment that patient is 1.8 meters (6 feet) around, connect peripherals to the auxiliary power outlet which is capable of isolation protection, or power the peripherals by auxiliary output cable or isolation transformer complied with IEC 60601-1-1 or the power input of the same safety level.
- Parts of non-medical electrical equipment in the patient environment that, after removal of covers, connectors, etc., without the use of a tool, may be contacted during the routine maintenance, calibration, etc. You should not touch the referred parts and the patient simultaneously.
- Do not use the probes other than those provided by the manufacturer. Otherwise, the ultrasound system cannot be performed, and an accident such as a fire may result in the worst case.
- Only the peripherals and accessories provided or recommended by the manufacturer can be used. Using other devices or accessories may degrade the system performance and even cause an electrical shock.
- Do not pour any fluid onto the ultrasound system surfaces, as fluid seepage into the electrical circuitry may cause excessive leakage current or system failure. If carelessly pour any water onto the system, immediately stop using the ultrasound system and contact Service Representative immediately.
- To avoid electrical shock and damage to the ultrasound system, power off and unplug the system from the AC power outlet before cleaning.
- To maintain the safety and functionality of the ultrasound system, maintenance must be performed at least every 6 months. Electrical safety tests must also be performed at regular intervals as specified by local safety regulations.

1.2.2 Mechanical Safety



WARNING

- Always use the handle to move the ultrasound system.
- Ensure the footswitch and AC adapter are disconnected, the system is powered off before moving the ultrasound system.
- Do not let the system strike walls or door frame.
- Limit movement to a slow careful walk.
- Do not place other objects on top of the control panel. Do not sit on the control panel or other part of the ultrasound system.
- Do not knock or shake the ultrasound system.

1.2.3 Accessories Caring



WARNING

- Do not use the footswitch in the operating room.
- Disconnect the probe from the system after freezing an image or powering off the system. Otherwise, the system or the probe could be damaged.
- Use the probe carefully. If any part of the probe surface is scratched, immediately stop using the probe. Otherwise, there is a danger of electric shock.
- After disinfecting the accessories, chemicals must be washed out or gases must be discharged thoroughly from the accessories. Remaining residual chemicals or gases could not only result in damage to the accessories but also can be harmful to human bodies.
- Only the trained physicians or sonographers under ultrasound guidance can handle the biopsy needle guides. During the operation, the operator must observe proper needle insertion sequencing with the needle guide in order to avoid undue discomforts, unnecessary risks or injuries to the patient.
- Contact with natural rubber latex may cause a severe anaphylactic reaction in persons sensitive to the natural latex protein. The operator and patients must avoid contact with these items. Refer to package labeling to determine latex content and FDA's March 29, 1991 Medical Alert on latex products.
- Use the legally marketed coupling gel in accordance with the relevant local regulations. Read and understand all precautions in the relevant manual of the coupling gel before using it.
- There is a cleared list of sterilants and high-level disinfectants for use in processing reusable medical and dental devices on FDA website. That list can be consulted to find agents that may be useful for probe disinfection. Please refer to the following URL for FDA-Cleared Sterilants and High Level Disinfectants: <http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/ReprocessingofSingle-UseDevices/ucm133514.htm>.

1.2.4 Biohazard Considerations



- To minimize the risk of cross-contamination or infectious diseases when performing the biopsy, the operator should wear disposable gloves, protective clothing or protective goggle if it is needed. Follow the working regulations strictly in case the skin contacts the samples.
- Some disinfectants or sterilant are acid or alkaline, the operator should take cautions in preventing hands or clothing from being directly contact with them. Wash hands or eyes immediately if they are contaminated by the disinfectants.
- Dispose of the cleaners, disinfectants or discard solutions in accordance with the local standards or regulations.

1.3 Acoustic Power Principle



WARNING

- Perform ultrasound procedures prudently under the guidance of the ALARA (as low as reasonably achievable) principle. Expose the patient to only the lowest practical transmit power levels in the shortest possible period to achieve a satisfactory diagnosis. Freeze the image when the system is not used.
- Do not continuously scan the same part of a patient or expose the patient to prolonged scanning. Doing so may harm the patient.
- Do not expose the fetus to prolonged scanning in the Doppler mode.
- To prevent from arm or neck injury, the operator should not stay at the same position for too long during patient scanning without taking break.
- Although the output power is automatically controlled for the selected applications, high TI values should be kept to a minimum or avoided in obstetric applications.
- You should be familiar with the performances and operations of the system, observe the ultrasound output parameters on the screen all the time.

1.3.1 Biological Safety

Diagnostic ultrasound is recognized as being safe, but the possibility of biological effects exists when using it in high exposure levels and long exposure times. Thus ultrasound should be used in a prudent manner to provide medical benefit to the patient.

1.3.2 ALARA

It is required to practice ALARA when using ultrasound energy. Practicing ALARA ensures that the total energy level is controlled below a low enough level at which bioeffects are not generated while diagnostic information is being accumulated. The total energy is controlled by output intensity and total radiation time. The output intensity necessary for examinations differs depending on the patient and the clinical case.

Not all examinations can be performed with an extremely low level of acoustic energy. Controlling the acoustic level at an extremely low level leads to low-quality images or insufficient Doppler signals, adversely affecting the reliability of the diagnosis. However, increasing the acoustic power more than necessary does not always contribute to an increase in quality of information required for diagnosis, rather increasing the risk of generating bioeffects.

The operator must take responsibility for the safety of patients and utilize ultrasound deliberately. Deliberate use of ultrasound means that output power of ultrasound must be selected based on ALARA. Additional information regarding the concept of ALARA and the possible bioeffects of Ultrasound is available in a document from the AIUM (American Institute of Ultrasound Medicine) title “Medical Ultrasound Safety”.

1.3.3 Mechanical and Thermal Indices

The display of the ultrasound system consists of two parts: Thermal Index (TI) and Mechanical Index (MI).

■ MI/TI Explanation

In October 1987, the American Institute of Ultrasound in Medicine (AIUM) ratified a report prepared by its Bioeffects Committee (Bioeffects Considerations for the Safety of Diagnostic Ultrasound, J Ultrasound Med., Sept. 1988: Vol. 7, No. 9 Supplement), sometimes referred to as the StoweReport, which reviewed available data on possible effects of ultrasound exposure. Another report “Bioeffects and Safety of Diagnostic Ultrasound” dated January 28, 1993, provides more current information.

Mechanical Index (MI)

Mechanical bioeffects are threshold phenomena that occur when a certain level of output is exceeded. The threshold level varies, however, with the type of tissue. The potential mechanical bioeffects varies with peak pressure and ultrasound frequency. The MI accounts for these two factors. The higher the MI value, the greater the likelihood of mechanical bioeffects occurring. There is no specific MI value that means that a mechanical effect is actually occurring. The MI should be used as a guide for implementing the ALARA principle.

Thermal Index (TI)

The TI value informs the operator about the conditions that might lead to an increase in temperature at the surface of the body, within the body tissue, or at the point of focus of the ultrasound beam on bone. That is, the TI value informs the operator about the potential temperature rise in body tissue. It is an estimate of temperature increase in body tissue with specific properties. The actual amount of any temperature rise is influenced by factors such as tissue type, vascularity, mode of operation and others. The TI value should be used as a guide for implementing the ALARA principle.

Depending on the examination and type of tissue involved, TI could be one of three types:

- Soft Tissue Thermal Index (TIS) is used when imaging soft tissue only, it provides an estimate of potential temperature rise in soft tissue.
- Bone Thermal Index (TIB) is used when bone is near the focus of the image as in the third trimester OB examination, it provides an estimate of potential temperature rise in the bone or adjacent soft tissue.

- Cranial Bone Thermal Index (TIC) is used when bone is near the skin surface as in transcranial examination, it provides an estimate of potential temperature rise in the bone or adjacent soft tissue.

■ MI/TI Display

TI and MI values are displayed in the real time scan on the screen. The operator should observe these index values during examinations and ensure that exposure time and output values are maintained at the minimum amounts needed for effective diagnosis.

The MI and TI precision is 0.1.

1.3.4 Probe Surface Temperature Limits

For probes intended for internal applications, e.g. the endocavitary or transesophageal probes, the surface temperature of the probe may be changed by adjusting the system parameters.

The maximum surface temperature of the endocavitary probes is 43°C. To protect the patient against the harm of excessive temperature, the probe stops working automatically when its temperature reaches the limit. The surface temperature of the probe displays on the lower left side of the screen.

PAT: 37°C	—	Patient Threshold Temperature
TIP: <28°C	—	Transducer Tip Temperature





1.3.5 Imaging Functions that Change Acoustic Output
















The qualified operator may use the system controls to limit the ultrasound output and to adjust the quality of the images. The operator should observe the acoustic output display for possible effects.


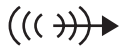







There are three categories of system controls relative to output. They are controls that have direct effect on the output, controls that indirectly control output and controls that are receiver controls.

1.4 Safety Symbols

The following table is provided for your identification of important symbols located in labels on the ultrasound system.

Symbol	Meaning
	General warning sign
	Dangerous voltage
	Risk of explosion if used in the presence of flammable anesthetics.
	This product is provided with a CE marking in accordance with the regulations stated in Council Directive 93/42/EEC.

Symbol	Meaning
	Authorized representative in the European community
	Type BF Applied Part
	Main switch OFF
	Main switch ON
	Power On/Off button
	Protective earth (ground)
	Equipotentiality
	Alternating current
	Direct current
IPN₁N₂	Degree of IP protection
	Non-ionizing electromagnetic radiation.
	Manufacturer
	Date of manufacture
	Consult operating instructions.
	Network Port
	USB Port

Symbol	Meaning
	Fragile
	AUDIO output
	Keep dry
	Maximum stacking limit of packages Maximum of two layers allowed for the system
	Keep this way upward
	Serial Number
	Use it in ventilated and dry indoor environment (for power supply adapter only)
	Rechargeable (for battery only)
	This symbol indicates that waste electrical and electronic equipment must not be disposed of as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.

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Chapter 2 System Overview

This ultrasound system adopts the advanced ultrasonic Doppler technologies.

To ensure the performance and availability of this ultrasound system, you should be thoroughly familiar with the operations of system components, the control panel, the key panel and the basic screen.

NOTE:

This manual provides operating instructions for a series product, and some options are not available on some models.

2.1 System Configuration

The ultrasound system consists of the followings parts:

- Main unit
- Footswitch
- AC power cable
- Cable hook
- Standard accessories package
- Standard ECG accessories package
- Basic User Manual
- Advanced User Manual
- Optional accessories: Battery model, transducer extender and remote control.

2.2 Physical Specifications

- LCD monitor: 15" color display
- System dimension: 413mm(L)×357mm(W)×391mm(D)
- System weight: approx. 8.4kg (including battery)

2.3 System Components



Figure 2-1 System Overview

2.3.1 Front Panel

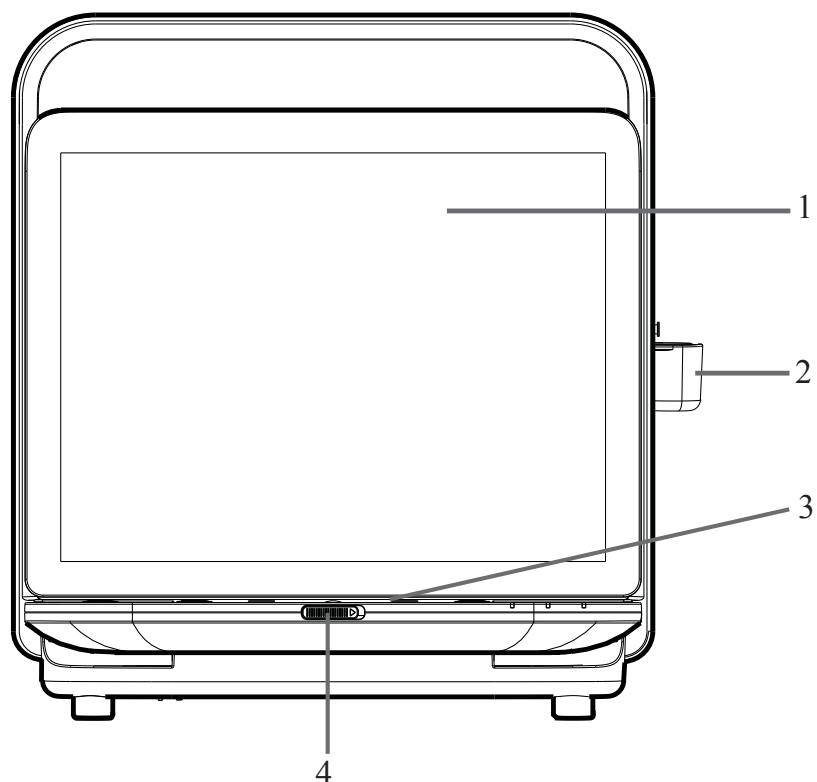


Figure 2-2 Front View

- | | |
|-----------------|----------------------|
| 1 LCD Monitor | 2 Probe Cable Hanger |
| 3 Control Panel | 4 Release latch |

2.3.2 Side View

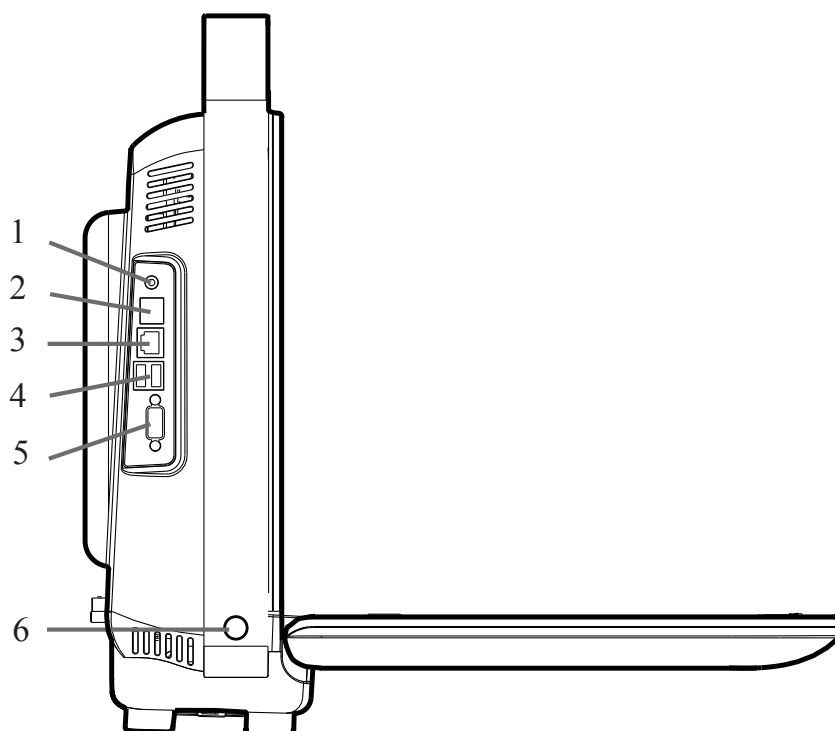


Figure 2-3 Side View

- | | |
|-------------------------|-----------------------|
| 1 Audio Output Port | 2 S-VIDEO Port |
| 3 Network Port (DICOM) | 4 USB Port |
| 5 VGA Video Output Port | 6 Power On/Off Button |

2.3.3 Rear Panel

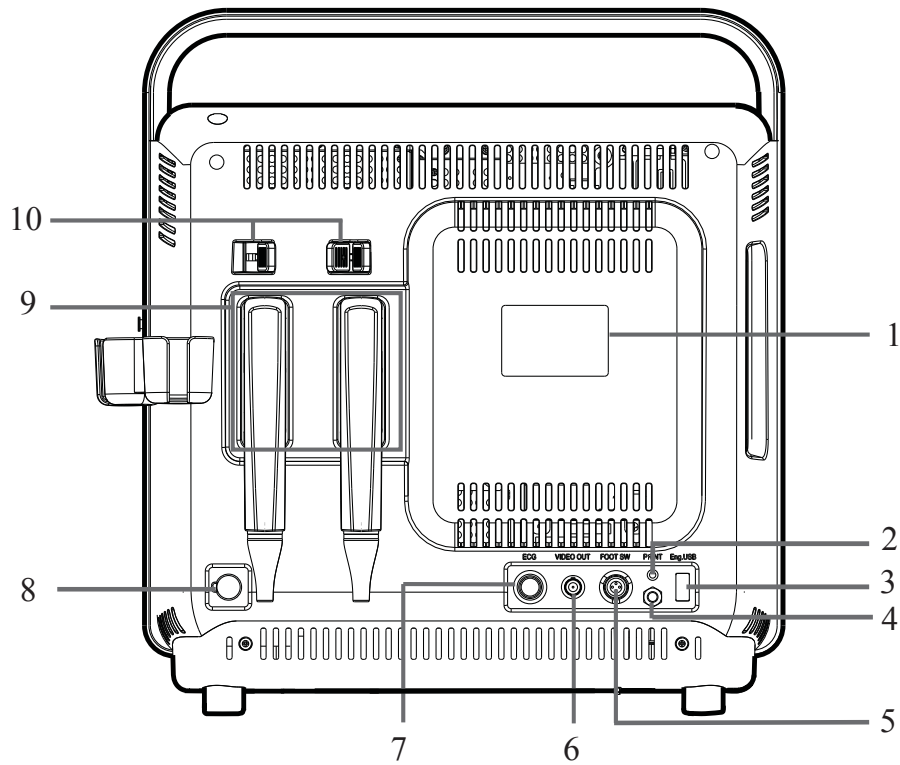


Figure 2-4 Rear Panel

- | | |
|-------------------|-------------------------|
| 1 Rating Label | 2 Video Printer Port |
| 3 USB Port | 4 Grounding Terminal |
| 5 Footswitch Port | 6 BNC Video Output Port |
| 7 ECG Port | 8 AC Adapter Port |
| 9 Probe Port | 10 Probe Lock |

2.3.4 Battery Compartment

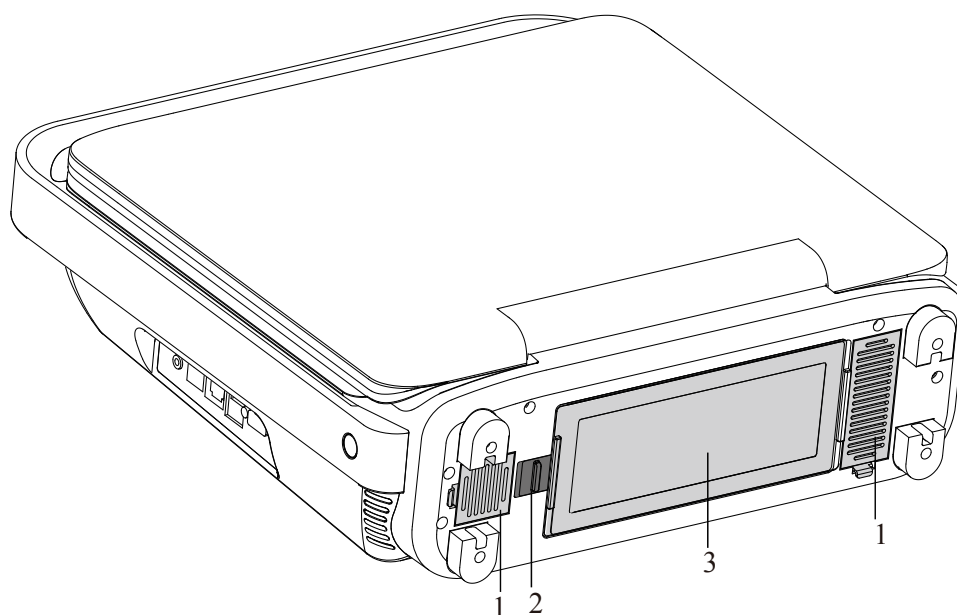


Figure 2-5 Battery Compartment View

- | | |
|---------------|----------------|
| 1 Dust Filter | 2 Battery Lock |
| 3 Battery | |

2.3.5 Control Panel

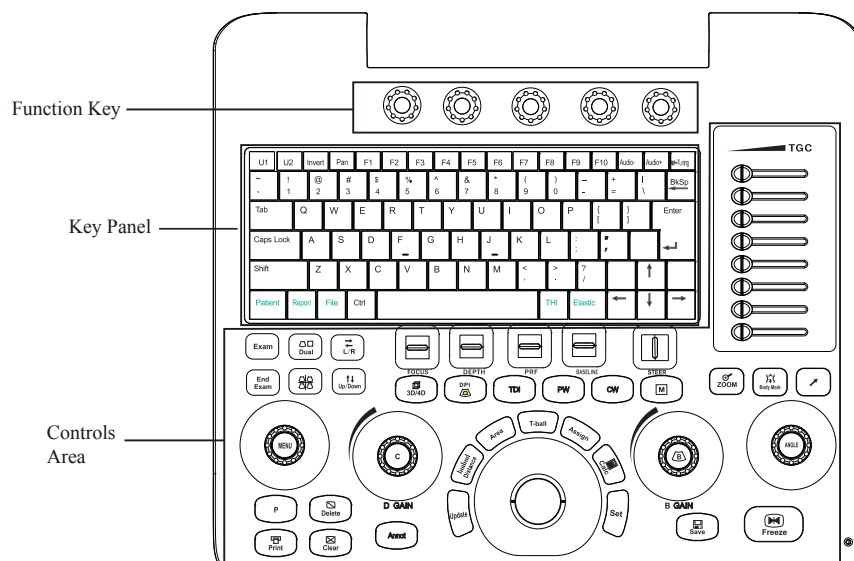



Figure 2-6 Control Panel

■ Function Key


Name	Description
 Function Key	<p>Five function keys are located below the selected item on the screen.</p> <ul style="list-style-type: none"> ■ Press it to select the corresponding menu item at the bottom of the screen. ■ Rotate it to make the setting of the selected menu item.


■ Key Panel

Name	Description
Patient	Select it to enter the New Patient screen.
Report	Select it to enter the Report screen.
File	<ul style="list-style-type: none"> ■ Select it to display the Patient Exam List screen. ■ Or, select it to enter the Review Image screen when creating a new patient exam.
Pan	Select it to enter the real time panoramic imaging mode.

Name	Description
AUDIO +	Select it to increase the volume in the PW mode.
AUDIO -	Select it to decrease the volume in the PW mode.
m-Tuning	Select it to optimize an image automatically.
U1	Reserved function keys
U2	
Elastic	
Invert	Select it to enable or disable the flow invert in the Color mode or frequency spectrum invert in the PW/CW mode.
THI	Select it to enter the Tissue Harmonic Imaging mode in the real time mode.

■ Controls Area




Name	Description
Exam	Select it to choose a probe and an icon for the corresponding exam type in the real time or frozen mode.
End Exam	Select it to end the exam for the current patient.
Dual	Select it to enable the dual display or to activate another image.
	Select it to enable the quad display or to activate another image.
L/R	Select it to reverse the image left or right. Select it to enter the dual or quad display in the dual/quad display mode.
Up/Down	Select it to reverse the image up or down.
DEPTH	Use it to adjust the scan depth. Move it downwards to increase the depth and move it upwards to decrease the depth.
FOCUS	Use it to adjust the position of the focus .
BASELINE	Use it to adjust the position of the baseline.

Name	Description
STEER	Use it to adjust the direction of the acoustic beam when performing a real time scan by using the linear probe. Or, use it to adjust the direction of the spectral Doppler line.
PRF	Use it to adjust the pulse repetition frequency.
3D/4D	Select it to enter or exit the 3D/4D imaging mode.
DPI	Select it to enter or exit the DPI mode.
TDI	Select it to enter or exit the TDI mode.
PW	Select it to enter or exit the PW mode.
CW	Select it to enter or exit the CW mode.
M	Select it to enter or exit the M mode.
Zoom	Select it to magnify the interest area of the ultrasound image.
Body Mark	Select it to add the body mark on the ultrasound image.
	Select it to add arrow on the ultrasound image.
Menu	Select it to enter the System Setting screen.
B	<ul style="list-style-type: none"> • Select it to activate the B mode. • Rotate it to adjust the gain value in the B mode.
C	<ul style="list-style-type: none"> • Select it to activate the Color mode. • Rotate it to adjust the gain value in the Color mode.
Angle	<ul style="list-style-type: none"> • Use it to adjust the magnification if the zoom feature is activated. • Rotate it to adjust the flow direction in the PW/CW mode. • Rotate it to adjust the arrow direction if the arrow annotation feature is activated. • Rotate it to adjust the bodymark direction if the bodymark annotation feature is activated. • Rotate it to adjust the measurement angle of the hip joint when performing the orthopedic measurements.
P	Reserved function key

Name	Description
Print	Select it to print the current screenshot if the video printer is successfully connected.
Delete	<ul style="list-style-type: none"> ● Select it to delete the current annotation and body mark when annotating an image. ● Select it to delete the selected measurement marker or result when performing the manual trace measurement.
Clear	Select it to remove all measurement results, annotations and body mark symbols from the display.
Annot	Select it to annotate an image with typed words.
Distance	<p>Select it to perform a distance measurement in the 2D (B/Color/DPI/TDI), M, 3D or 4D mode.</p> <p>Or, select it to perform the semi-auto trace measurement in the PW/CW mode.</p>
Update	<ul style="list-style-type: none"> ■ Select it to enter the M mode in inactivated M mode. ■ Select it to enter the PW/CW mode in the inactivated PW/CW mode. ■ Select it to switch between measurement markers when performing the distance or ellipse measurement. ■ Select it to undo the trace in the manual trace measurement.
Area	<ul style="list-style-type: none"> ● Press it to perform the trace measurement in the 2D (B/Color/DPI/TDI), M, 3D or 4D mode. Press it twice to perform the ellipse measurement in the 2D (B/Color/DPI/TDI), M, 3D or 4D mode. ● Press it to perform the slope measurement in the M mode. Press it twice to perform the time measurement in the M mode. ● Press it to perform the manual trace measurement in the PW/CW mode. Press it twice to perform the auto/semi-auto trace measurement in the PW/CW mode.
T-ball	<ul style="list-style-type: none"> ● Select it to activate the clipboard in the 2D (B/Color/DPI/TDI) or M mode. ● Select it to activate the trackball cursor in the 3D/4D mode.
Assign	Reserved function key
Calc	Select it to activate the specified calculation menu which varies with the imaging mode.
Set	Select it to confirm the current operation.

Name	Description
Save	Select it to save the image or cine in the frozen mode.
Trackball	Use it to move the cursor.
Freeze	Select it to freeze the image in the real time mode. Or, select it again to restore the real time scan.
TGC	Use these 8 TGC slide pots to adjust the gain value of the specific area on the image.

■ Status Indicator

Indicator	Description
	Indicates the battery discharging status.
	Indicates the battery charging status.
	Indicates the connecting status of the adapter.

2.3.6 Basic Screen

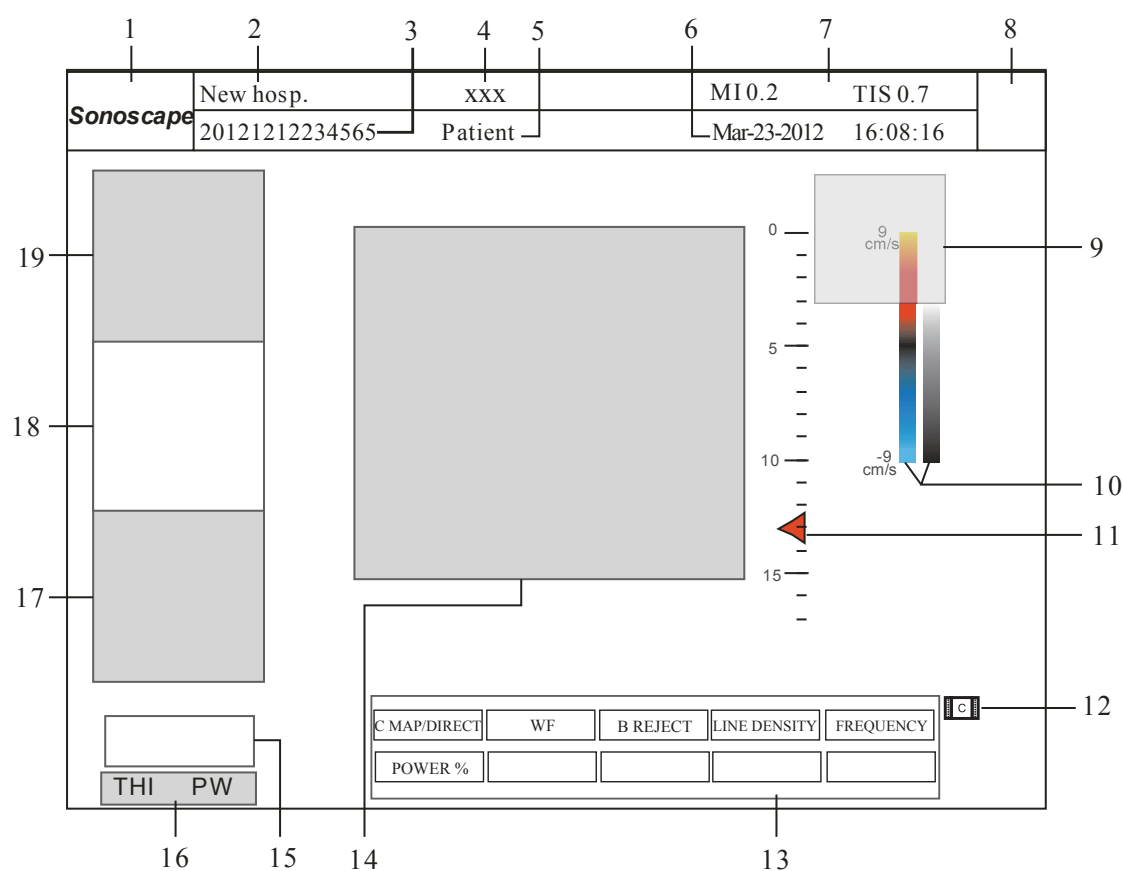


Figure 2-7 Basic Screen

- | | |
|--|---|
| 1 Logo | 2 Institution Name |
| 3 Patient ID | 4 Probe Model |
| 5 Patient Name | 6 System Date and Time |
| 7 MI and TIS Indices | 8 Application Icon |
| 9 Measurement Result Area | 10 Color Map (in Color/DPI mode) /Grayscale Map |
| 11 Depth Scale and Focal Position | 12 Hint |
| 13 Image Parameters | 14 Imaging Area |
| 15 Cine Review Status (in frozen mode) | 16 THI and PW/CW Status Identification |
| 17 PW/CW Doppler or M-Mode | 18 Color Mode Imaging Information |
| 19 B Mode Imaging Information | |

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Chapter 3 Preparing the System

System preparation is necessarily performed before you using the ultrasound system. The preparation includes but not limit to positioning and adjusting the system, connecting the probe and the peripheral devices.

3.1 Positioning the System



CAUTION Leave at least 20cm at the back and both sides of the ultrasound system for ventilation. Otherwise, the temperature rise could cause failures.

Place this system on a level surface.

You can place the system on the trolley provided by manufacturer (sold separately). For details on positioning the system, please refer to the relevant user manual.

3.2 Powering on the System

The system can be supplied power by mains supply or built-in rechargeable lithium battery.

When the adapter is connected to the mains supply, the battery is charged until full.

3.2.1 Using the Mains Supply



- WARNING** ● Do not use the adapter other than those provided by the manufacturer.
- The accompanying AC adapter can only be used for power supply or battery recharging of the system. Other usages may damage the adapter or even cause an electric shock.
- Check that the adapter is not damaged before use. If damages exists, stop using it immediately and contact the manufacturer or the local distributor.
- Do not hang the adapter in the air.
- The adapter should be placed in a well ventilated area during use. Do not cover the AC adapter with any other objects.

■ To connect the adapter

1. Connect the protective earth pin at the rear panel to safety ground (earth) with the grounding wire.
2. Connect one end of the adapter to the system and connect the other end to the mains supply firmly.

After use, disconnect the cable from the mains supply and then disconnect the grounding wire.

3.2.2 Using the Battery



- WARNING** ● Do not disassemble or alter the battery. Otherwise, there is a danger of explosion.
- Replace the battery with the same or the equivalent type.

- Do not short-circuit the battery by directly connecting the system with metal objects.
- If the battery emits an odor or heat, is deformed or discolored, or appears abnormal during use, charging or storage, remove it and stop using it immediately. If you have any questions about the battery, please contact the manufacturer.
- Do not use a battery if it leaks. If your skin or clothing is stained with the fluid from the battery, thoroughly wash the area immediately with clean water. If the fluid comes in contact with your eyes, immediately flush the eyes with water and seek the oculist for help.
- If the battery is found damaged, severely degraded or used for 3 years, dispose of it in accordance with the local laws or regulations.

If the system is connected to the mains supply with the adapter, the battery is charged automatically.

If the adapter is disconnected, the system is supplied power by the battery.

A fully charged battery can work continuously for more than 1 hour.

■ Specifications of the battery

Rated voltage: 14.8V

Capacity: 9.6Ah/142Wh




- CAUTION • Only use the battery once there is an emergency or no reliable AC power supply. It is recommended to use the AC supply instead of the battery.
- If the battery has not been used for 3 months, it is recommended to store the battery in the temperature range from -20°C to 45°C with fully charged. If the battery has not been used for more than 3 months, it is recommended to charge the battery once at least every 3 months to avoid of liquid leakage.
- Charge the battery in the temperature range from 0°C to 45°C and discharge it in a temperature range from 0°C to 60°C to maintain the lifespan of the battery.
- Always charge the battery fully to maintain the lifespan of the battery.
- It is highly recommended to perform one full discharge/charge cycle before first time usage. A full discharge/charge cycle means the system is turned on using battery power until the battery loses its charge completely and the system shuts down. Thereafter, fully charge the battery until the charging indicator illuminates in green.
- When the battery capacity is low and the battery cannot be charged in time, you need to save all unsaved data before the system automatically shuts down. Otherwise, you may lose useful information.

- To avoid the battery damage causing the system damage, observe the following precautions:
 - * Do not immerse the battery in water or allow it to get wet.
 - * Do not discard the battery in a fire.
 - * Do not expose the battery under the sunlight or leave it in the environment over 60°C.
 - * Keep the battery away from fire and other heat sources during its usage and charge.
 - * Do not pierce the battery with a sharp object, hit or step on it.
 - * Do not place the battery into the microwave oven or other pressure vessels.

3.2.3 Assembling/Disassembling the Battery

- To assemble the battery

Switch the battery lock on the bottom to  position, and install the battery on the system as shown in Figure 3-1.

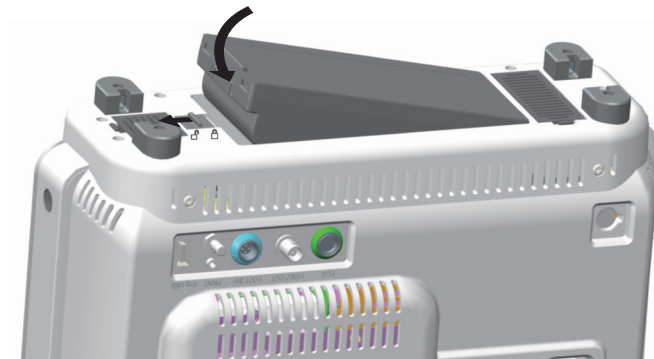


Figure 3-1 Battery Assembly

- To disassemble the battery

Switch the battery lock on the bottom to  position, and take out the battery as shown in Figure 3-2.

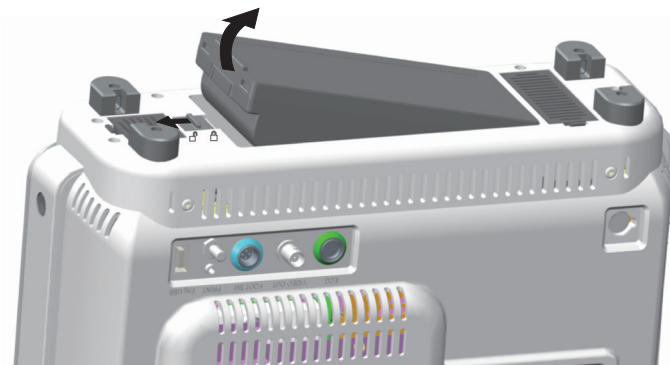


Figure 3-2 Battery Disassembly

3.2.4 Status Indicator




When the system is connected to the mains supply using the adapter, the battery discharging indicator  is always off. The status of other indicators is shown in Table 3-1.

Table 3-1 Status Indicator

Indicator	Fully Charged	Charging
	Green	Yellow
	Green	Green




When the adapter is disconnected, the battery charging indicator  and the adapter status indicator  is always off. The status of the battery discharging indicator  is shown in Table 3-2.

Table 3-2 Battery Status

Discharging Indicator	Battery Status	Note
Green	Full	\
Yellow	Low	\
Blinking yellow	The battery is extremely low and the system is going to power off.	Buzzer alarms.

3.3 Powering On/Off the System



- Do not power off the system during system upgrade or data transmission.
- Extra 30-60 seconds are needed for powering on the system if it is powered off in abnormal way last time.
- If the system is configured with the μ Scan feature, do not connect the USB device to the system before system startup.
- Wait approximately 20 seconds before powering on the ultrasound system again. Otherwise, a failure may result.
- To maintain the safety and functionality of the ultrasound system, regular maintenance must be performed as described in Chapter 13 System Maintenance.
- Ensure the system works in accordance with requirements in Appendix A Specifications.


■ To power on the system

1. Connect to the adapter to system and the mains supply.

2. Press  on the left side of the system to power on the system.

All operating indicators illuminate, the initial screen and the application mode screen appear after the system completes the initialization.

■ To power off the system

Press  on the left side of the system to power off the system.

■ System Standby

If the ultrasound system is idle for a set period, the system enters the standby mode automatically.

3.4 Adjusting the System

Grip the left and right sides of the screen, swivel the screen forwards or backwards.


3.5 Connecting the Probe



WARNING

Disconnect the probe from the system after freezing an image. Otherwise, the probe could be damaged.


■ To connect the probe to the system

1. Switch the probe lock above the probe port to  position, and then insert the probe connector into the probe port firmly.


2. Switch the probe lock to lock it securely.

If the probe cable is too long, hang it on the transducer cable hanger.

■ To connect the probe to the transducer extender


1. Switch the probe lock above the probe port on the system to  position, and then insert the probe connector of the transducer extender into the probe port firmly.

2. Switch the probe lock to lock the extender securely.

3. Switch the probe lock above the probe port on the transducer extender to  position, and then insert the probe connector of into the probe port of the extender firmly.

4. Switch the probe lock to lock the probe securely.

■ To disconnect the probe

Switch the probe lock above the probe port on the system or the probe port on the transducer extender to  position, and then pull the probe connector out directly.

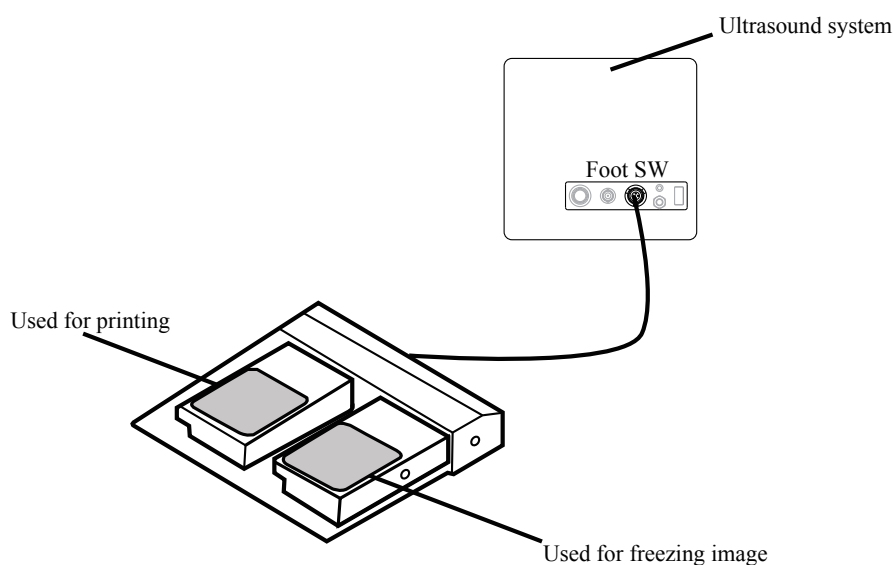
3.6 Connecting the Peripheral Device

3.6.1 Connecting the Footswitch

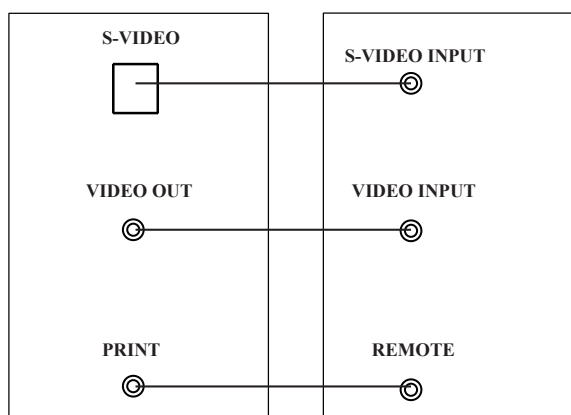


CAUTION Do not use the footswitch other than those provided by the manufacturer. Otherwise, the ultrasound system or the footswitch malfunctions could result.

Connect the footswitch to the footswitch port of the ultrasound system as the figure shown below.



3.6.2 Connecting the Video Printer

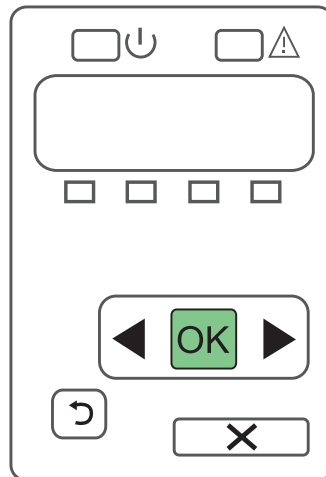


Connect the video printer to the ultrasound system by the S-VIDEO cable, BNC cable and Remote Control cable provided by the manufacturer. You can refer the installation method as the above figure shown. The video printer is ready to work immediately without any configurations after a successful connection.

3.6.3 Connecting the Network Printer

■ Printer Setup

1. Connect the printer to the ultrasound system, and turn on the printer. The printer settings are displayed as below.



2. Press **OK** on the control panel menu of the printer.
3. Press ◀ or ▶ to select **Network Config**, and then press **OK** to confirm.
4. Press ◀ or ▶ to select **TCP IP Config**, and then press **OK** to confirm.
5. Press ◀ or ▶ to select **Manual**, and then press **OK** to confirm.
6. An IP address is displayed, change it to **192.168.254.183** by pressing ◀ or ▶, and then press **OK**.
7. If the IP address is correct, use ◀ or ▶ to select **Yes**, and then press **OK**.
If the IP address is incorrect, use ◀ or ▶ to select **No**, and then press **OK**. Repeat step 6 to enter a correct address.
8. After setting IP address, set the subnet mask to **255.255.255.0** and default gateway to **192.168.254.183** in the same way as described above.

■ Ultrasound System Setup

1. Copy the driver file **deskjet.ppd** provided by the manufacturer into the directory of the USB drive.
2. Connect the drive to the ultrasound system, and then start up the ultrasound system.
3. Choose **System Settings** -> **Set Printer** -> **Insert Driver** by using the trackball on the ultrasound system.
4. Press the **Set** key on the control panel to complete the installation of the printer drive.
5. Reboot the ultrasound system if the installation is completed.

■ IP Address Setup

1. Choose **System Settings** -> **DICOM Settings** -> **Local** -> **Static IP** by using the trackball on the ultrasound system.
2. Set **IP Address** to **192.168.254.183**, set **Netmask**, **Gateway**, **Printer IP**, **MACAddr**, **AE Title** respectively, and then click **Save**.

NOTE:

IP address and **Printer IP** should be set in the same network segment.

3. Type the IP address of the printer into the textbox beside **Ping IP Addr** and click **Ping** to verify that the system and the printer is correctly connected. After successful verification, you can print the file.

3.6.4 Connecting the USB Printer

1. Copy the driver file **deskjet.ppd** provided by the manufacturer into the directory of the USB drive.
2. Connect the USB drive to the ultrasound system, and then start up the ultrasound system.
3. Choose **System Settings** -> **Set Printer** -> **Insert Driver** by using the trackball on the ultrasound system.
4. Press the **Set** key on the control panel to display **Insert USB including deskjet.ppd**, and press the **Set** key again to complete the installation of the printer drive. Reboot the ultrasound system if the installation is completed.

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Chapter 4 Customizing Your System

The System Settings menu allows you to specify general system settings, printing, measurement and calculation settings. You can also define the annotation library and shortcut keys. All your customized settings can be saved and can function even after you rebooting the system.

After starting up the ultrasound system, the LCD monitor displays the available probe and the application mode screen as shown in Figure 4-1.

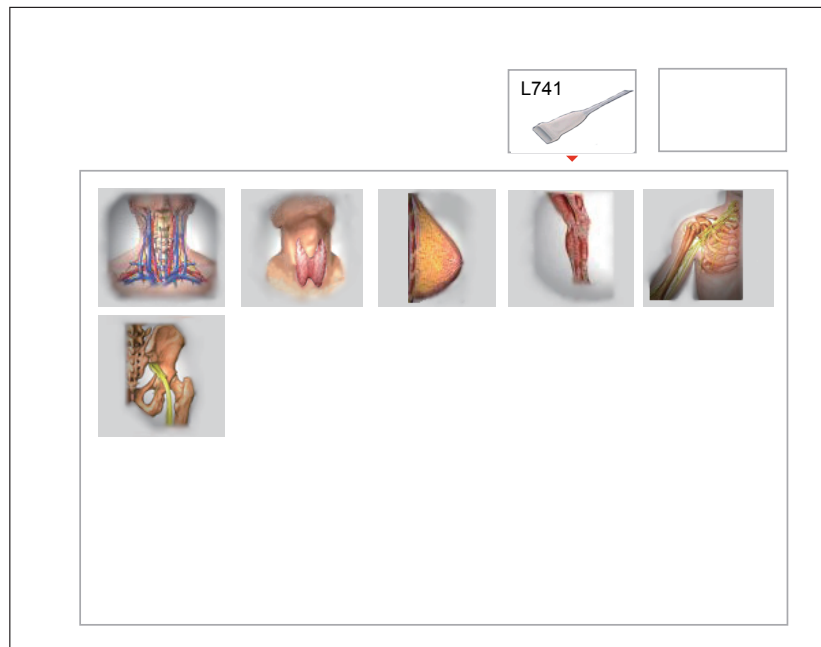


Figure 4-1 LCD Monitor

Select the **Menu** key on the control panel to enter the **System Setting** menu.

To make settings on the **System Setting** menu,

- Select one tab by using the trackball to enter a setting menu.
- Select a textbox beside one item, and then type the setting by using the keyboard.
- Select the drop-down box beside one item to make an option for this item.
- Select **Apply** to save the setting.
- Select **Exit** to quit the **System Setting** menu.

4.1 General System Settings

Set the general settings, display settings and storage settings on this menu.

4.1.1 General Settings

The screenshot shows the 'System Setting' window with the 'General' tab selected. On the left is a sidebar with buttons: 'General' (selected), 'Peripheral', 'Measure', 'DICOM', 'Load Default', 'About', and 'Exit'. The main area contains the following settings:

- Hospital Name:** NEW SITE
- Language:** English (dropdown arrow)
- Freeze Response:** Cine (dropdown arrow)
- Trackball Sensitivity:** 3 (dropdown arrow)
- Date/Time:**
 - Date Format:** MM/DD/YYYY (dropdown arrow)
 - 05/05/2014 16:00:00
 - Date/Time Setting** (button)
- Report Format:** PDF (dropdown arrow)
- Monitor Type:** TV-NTSC (dropdown arrow)
- Caps Lock:** ON (dropdown arrow)
- Clear Annot On Unfreeze:** ON (dropdown arrow)

An 'Apply' button is located at the bottom right of the settings area.

Figure 4-2 General Settings Menu

Item	Description
Hospital Name	Enter the hospital name.
Language	Choose a system language for the user interface, and reboot the system to take effect.
Freeze Response	Select the feature to be enabled after you select the Freeze key. Choose from: Cine, Annot, Calc, Body Mark, Arrow or Distance .
Trackball Sensitivity	Adjust the sensitivity for the trackball movement. A greater value brings about the higher sensitivity. Choose from: 1, 2, 3, 4, 5, 6
Date Format	Set the date format for the ultrasound system. Choose from: MM/DD/YYYY, YYYY/MM/DD or DD/MM/YYYY .

Item	Description
Date/Time Setting	<p>Set the system date and time.</p> <p>Select this item, set the system date and time manually in the pop-up text box.</p> <p>NOTE:</p> <p>You should set the system date and time for your initial use of the ultrasound system.</p>
Caps Lock	<p>Enable or disable the letter capital feature.</p> <ul style="list-style-type: none">■ Set it to On, all the typed letters are capital. Pressing Shift + X can enter a lower-case letter.■ Set it to Off, all the typed letters are lowercase. Pressing Shift + X can enter a capital letter.
Report Format	<p>Set the format for the report output.</p> <p>Choose from: PDF or TEXT</p>
Monitor type	<p>Set the format for the video.</p> <p>Choose from: TV-NTSC, TV-PAL or VGA</p>
Clear Annot On Unfreeze	<p>Enable or disable the annotation-cleared feature after you unfreeze the image in the annotation editing mode.</p> <ul style="list-style-type: none">■ Set it to ON, all annotations are cleared after you press the Freeze key in the annotation editing mode.■ Set it to OFF, all annotations are not cleared.

4.1.2 Display Settings

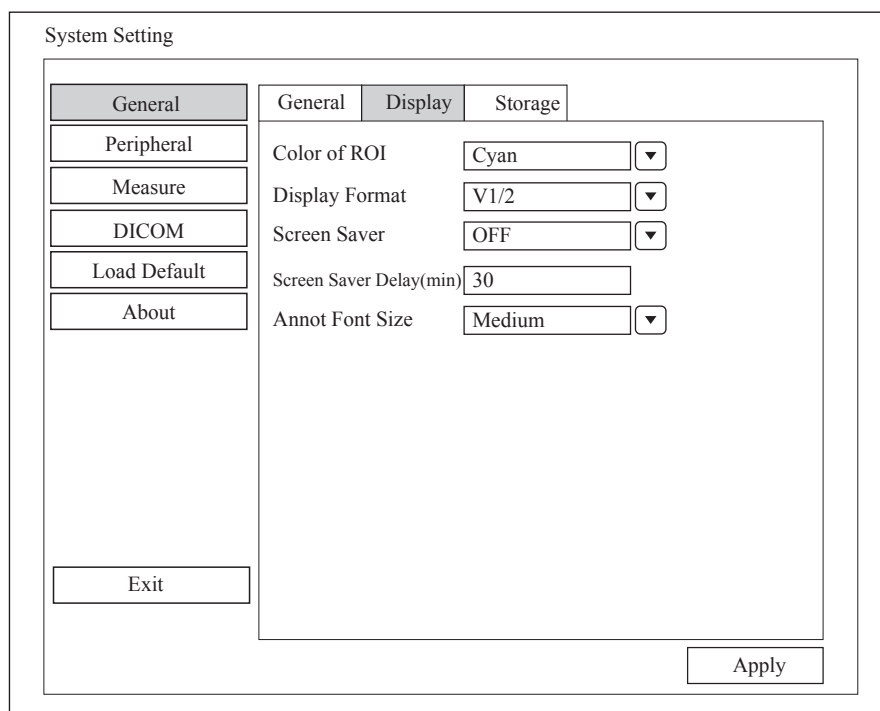


Figure 4-3 Display Settings Menu

Item	Description
Color of ROI	Set the color for the interest region box. Choose from: Green, Yellow, Orange or Cyan
Display Format	Set the default display format for the M and PW/CW modes. Choose from: V1/3, V1/2, V2/3, H1/2, H1/4, O1/4
Screen Saver	Set the screen saver time.
Screen Saver Delay	Set the time to activate the screen saver.
Annot Font Size	Set the font size of the annotations. Choose from: Large, Medium or Small

4.1.3 Storage Settings

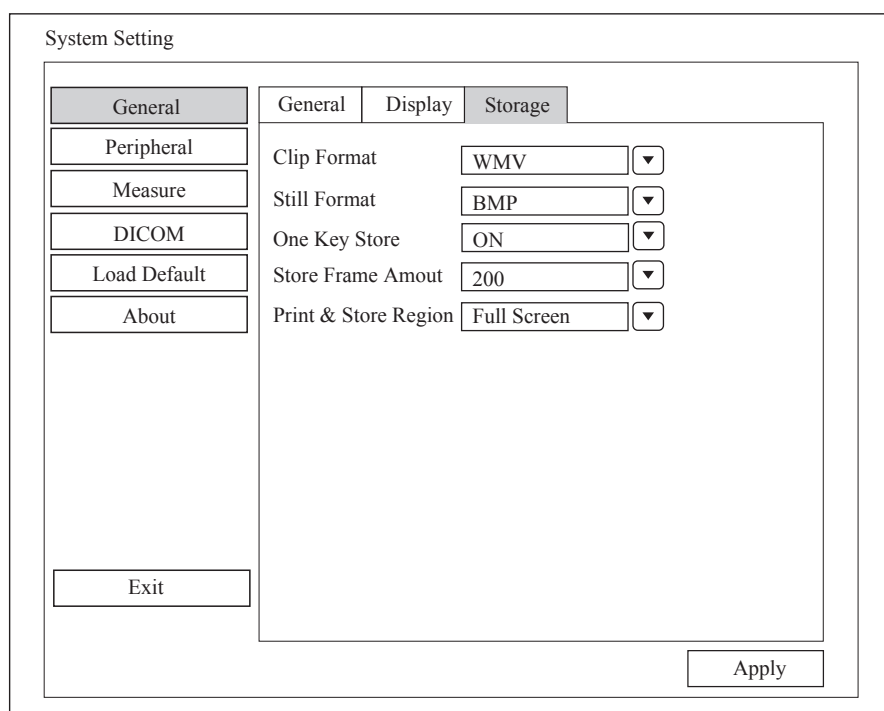


Figure 4-4 Storage Settings Menu

Item	Description
Clip Format	Set the saving format for cine. Choose from: WMV or AVI
Still Format	Set the saving format for the image. Choose from: JPG, BMP or TIF
One Key Store	Enable or disable the one key save function. Set it to ON , the image or cine is saved automatically by selecting the Save key on the control panel in the frozen mode. Set it to OFF , you need to manually save the image or cine in the frozen mode. Operation refers to 10.1 Storing an Image.
Store Frame Amount	Set the maximum number of frames for cine. The range is 100-1000 frames.
Print&Store Region	Set the area to be printed out. Choose from: Full Screen, Image Area or Image&Result Area

4.2 Peripheral Device Settings

You can set the local network and printer on this menu.

System Setting

General
Peripheral
Measure
DICOM
Load Default
About

Local Network

☐ DHCP ☐ Static IP

IP Address: . . .

Netmask: . . .

Default Gateway: . . .

DICOM AE Title:

Mac Address:

Ping IP Address:

Ping

Printer

Printer Driver: Default Printer ▼

Video Invert: OFF ▼

Default Printer: Net Printer ▼

Net Printer IP: . . .

Add Printer

Exit

Apply

Figure 4-5 Peripheral Device Settings Menu

■ Local Network

Item	Description
Address Mode	Select an IP address mode. Choose from: DHCP (dynamic IP) or Static IP
IP Address	Set the IP address of the ultrasound system.
NetMask	Set the netmask address of the ultrasound system.
Default Gateway	Set the gateway address of the ultrasound system.
DICOM AE Title	Set the Application Entity (AE) title of the ultrasound system.
Mac Address	Set the MAC address of the ultrasound system.
ping IP Addr.	Type an IP address and click Ping to test the connectivity of the system.

■ Printer Settings

Item	Description
Printer Driver	The default option is the printer driver installed at the last time.
Video Invert	Color is inverted when printing the report.
Default Printer	Set the type of the default printer. Choose from: USB Printer or Net Printer .
Net Printer IP	Set an IP address of the network printer.
Add Printer	Click the button and follow the on-screen instructions to install a printer driver.

4.3 Measurement Settings

You can set the general settings, measurement menu and calculation formula on this menu.

4.3.1 General Settings

The screenshot shows the 'System Setting' dialog box with the 'Measure' tab selected. The 'General' sub-tab is active, displaying various measurement settings. On the left, there is a vertical list of tabs: General, Peripheral, Measure (selected), DICOM, Load Default, and About. Below these is an 'Exit' button. The main area is divided into two sections: 'Basic' and 'Shortcut Key'. The 'Basic' section contains settings for BSA (Eastern), Measure Method (Trace), Package (Icon Driven), Continue DIST (On), Focal Auto (On), AUA Result by (Average), Unit (kg,g), Measure Font Size (Medium), and Measure Line Size (Medium). The 'Shortcut Key' section has three sub-tabs: OB (selected), Cardiac, and GYN. It lists 11 numbered items (Num 1 to Num 0) with corresponding dropdown menus. An 'Apply' button is located at the bottom right.

System Setting	
General Menu Formula	
General	
Peripheral	
Measure	
DICOM	
Load Default	
About	
Exit	
Basic	
BSA	Eastern
Measure Method	Trace
Package	Icon Driven
Continue DIST	On
Focal Auto	On
AUA Result by	Average
Unit	kg,g
Measure Font Size	Medium
Measure Line Size	Medium
Shortcut Key	
OB Cardiac GYN	
Num 1	...
Num 2	...
Num 3	...
Num 4	...
Num 5	...
Num 6	...
Num 7	...
Num 8	...
Num 9	...
Num 0	...
Apply	

Figure 4-6 Measurement Settings Menu

■ General Settings

Item	Description
BSA	<p>In accordance with the setting of this item, the system calculates BSA value automatically after you enter the height and weight of the patient on the Patient Information screen.</p> <p>Choose from: Western or Eastern</p> <ul style="list-style-type: none"> ■ Set it to Eastern, the following formula is adopted: $BSA = WT^{0.425} \times HT^{0.725} \times 0.007358$ ■ Set it to Western, the following formula is adopted: $BSA = WT^{0.425} \times HT^{0.725} \times 0.007184$ <p>WT stands for weight (unit: kg), HT stands for height (unit: cm)</p>
Measure Method	<p>Set the measurement method for percentages of stenosis-diameter or area reduction in the B mode.</p> <p>Choose from: Trace or Ellipse</p>
Package	<p>All available items are displayed on the calculation menu in any application mode.</p>
Continue DIST	<p>Enable or disable the feature of the continuous distance measurement.</p> <ul style="list-style-type: none"> ■ Set it to On, multiple distance measurements can be performed by selecting the Distance key on the control panel for one time. ■ Set it to Off, only one distance measurement can be performed by selecting the Distance key on the control panel.
Focal Auto	<p>Enable or disable the auto-focus feature.</p> <ul style="list-style-type: none"> ■ Set it to On, the focal depth varies with the depth in the B mode. And the focal depth varies with ROI position in the Color/DPI/TDI mode. ■ Set it to Off, the system never adjusts the focal depth.
AUA Result by	<p>Set the AUA formula.</p> <ul style="list-style-type: none"> ■ Set it to Average, the system calculates the AUA according to the average value of all measurement items. ■ Set it to Last, the system calculates the AUA according to the last measurement items.
Unit	<p>Set the EFW unit for the obstetrics calculation.</p> <p>Choose from: lb.oz or kg,g</p>

Item	Description
Measure Font Size	Set the font size of the measurement results. Choose from: Small, Medium or Large
Measure Line Size	Set the thickness of the measurement line. Choose from: Small, Medium or Large

■ Shortcut Key Settings

Select **OB**, **Cardiac** or **GYN** tab and then select an measurement item from the drop-down box beside **Num 1** to **Num 9**. After making this settings, you can perform the Obstetrics, Cardiology or Gynecology measurement by using the defined shortcut key in the frozen mode.

4.3.2 Measurement Menu Settings

You can configure the measurement settings to display the measurement items during 2D, PW or M-mode measurement.

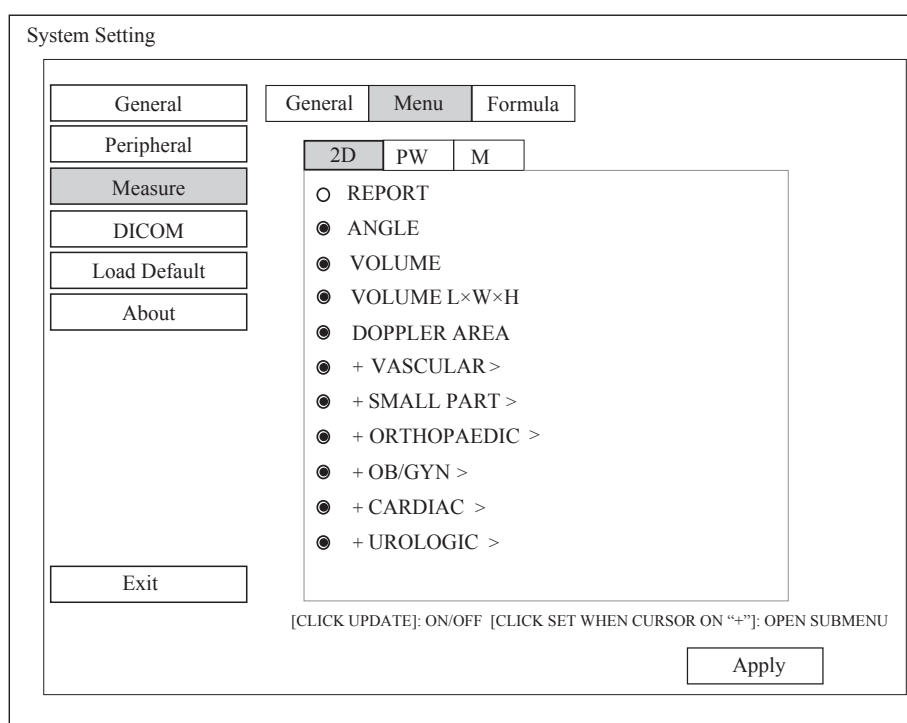


Figure 4-7 Calculation Settings Menu

- Select an item, select the **Update** key on the control panel to display this item. Or, select the **Update** key again to hide this item.
- **+** appears before an item if this item contains submenu. Select the **Set** key to display or hide the submenu.

4.3.3 Calculation Formula Settings

System Setting

General	General	Menu	Formula
Peripheral	EFW		WEI/SAB HC/AC/FL ▼ *
Measure	BPD		Hadlock ▼ *
DICOM	FL		Hadlock ▼ *
Load Default	CRL		Robinson ▼ *
About	AC		Hadlock ▼ *
	TAD		Hansmann ▼ *
	OFD		Hansmann ▼ *
	HC		Hadlock ▼ *
	GS		Nyberg ▼ *
	Fibula		Merz ▼ *
Exit	Radius		Merz ▼ *
	Humerus		Jeanty ▼ *
	ULNA		Jeanty ▼ *
	TIBIA		Jeanty ▼ *

Apply

Figure 4-8 Calculation Formula Settings Menu

Click * behind each item to edit the item.

Item	Description
EFW	Set the EWF formula. Choose from: WEI/SAB HC/AC/FL , Shepard AC/BPD , Handlock 1 AC/FL , Hansmann AC/FL/HC , Tokyo BPD/APTD/TTD/FL , Handlock 2 AC/FL , Handlock 3 BPD/AC/FL , Handlock 4 HC/AC , Handlock 5 HC/AC/FL , Shinozuka BPD/AC/FL , Warsof FL/AC , Campbell AC , Mediscan FLAC or Mediscan BPDAC .
BPD	Set the BPD formula. Choose from: Hadlock , Jeanty , Crespigney , Kurtz , Hansmann , Sabbagha , Campbell , Tokyo , Merz or Osaka .
FL	Set the FL formula. Choose from: Hadlock , Hohler , Jeanty , Hansmann , Tokyo , Merz , Chitty , Osaka or Campbell .

Item	Description
CRL	Set the CRL formula. Choose from: Robinson, Hadlock, Nelson, Jeanty, Hansmann, Mediscan, Tokyo or Osaka.
AC	Set the AC formula. Choose from: Hadlock, Hansmann, Tokyo, Merz or Campbell.
TAD	Set the TAD formula. Choose from: Hansmann.
OFD	Set the OFD formula. Choose from: Hansmann.
HC	Set the HC formula. Choose from: Hadlock, Jeanty, Chitty(M), Chitty(D), Merz or Campbell.
GS	Set the GS formula. Choose from: Nyberg, Hansmann, Hellman, Tokyo or China.
Fibula	Set the Fibula formula. Choose from: Merz.
Radius	Set the Radius formula. Choose from: Merz or Mediscan.
Humerus	Set the Humerus formula. Choose from: Jeanty, Merz or Osaka.
Ulna	Set the Ulna formula. Choose from: Jeanty, Merz or Mediscan.
Tibia	Set the Tibia formula. Choose from: Jeanty or Merz.

4.4 Configuring DICOM

4.4.1 Storage Service Settings

You can connect the ultrasound system to the DICOM storage server by setting this menu.

System Setting

General Store C-Store Worklist MPPS Print

Peripheral

Measure

DICOM

Load Default

About

Service List DicomStore Add Delete

DICOM Image Storage

Remote HostName DicomStore

IP Address 192.168.254.104 Ping

DICOM AE Title AE Echo

Port Number 104

Connect Timeout(sec) 10 Repeat Count 2

Dimse Timeout(sec) 10 Acse Timeout(sec) 30

☐ Send After Every Image Stored

☐ Send At End of Exam

Apply

Exit

Figure 4-9 DICOM Storage Service Menu

Item	Description
Service List	Select the DICOM storage server. Click Add to add a new server and click Delete to delete a server.
Remote HostName	Set the name of DICOM storage server.
IP Address	Set the IP address of the DICOM storage server. After the setting, click Ping to test the connectivity of the system.
DICOM AE Title	Set the Application Entity (AE) title of the DICOM storage server.
Port Number	Set the port number of the DICOM storage server.
Connect Timeout(sec)	Set the period of network connection timeout.
Repeat Count	Set the repeated times of connecting the DICOM storage server.
Dimse Timeout(sec)	Set the timeout time of connecting the Dimse protocol.
Acse Timeout(sec)	Set the timeout time of connecting Acse protocol.

Item	Description
Send After Every Image Stored	Enable this item, the system sends image to the DICOM storage server every time the image is saved.
Send At End of Exam	Enable this item, the system sends all saved images to DICOM storage server after the exam is complete.

Click **Echo** to verify the connection between the ultrasound system and the DICOM storage server after you make settings about the **Remote HostName**, **IP address**, **DICOM AE Title**, **Port Number**. A summary displays if the connectivity is verified.

4.4.2 Commitment Settings

You can connect the ultrasound system to the DICOM commitment storage server by setting this menu.

The screenshot shows the 'System Setting' window with the 'DICOM' tab selected. Under 'DICOM Storage Commitment', the following settings are visible:

- Service List:** A dropdown menu showing 'StoreCommitment', with 'Add' and 'Delete' buttons.
- Remote HostName:** A text field containing 'StoreCommitment'.
- IP Address:** A text field containing '192.168.254.104', with a 'Ping' button.
- DICOM AE Title:** A text field containing 'AE', with an 'Echo' button.
- Port Number:** A text field containing '105'.
- Connect Timeout(sec):** A text field containing '10'.
- Repeat Count:** A text field containing '1'.
- Dimse Timeout (sec):** A text field containing '10'.
- Acse Timeout (sec):** A text field containing '30'.
- Synchronously Receive N-EVENT-REPORT Message:** An unchecked checkbox.
- Buttons:** 'Exit' at the bottom left and 'Apply' at the bottom right.

Figure 4-10 Storage Commitment Settings Menu

Item	Description
Service List	Select the DICOM commitment storage server. Click Add to add a new server and click Delete to delete a server.
Remote HostName	Set the name of DICOM commitment storage server.
IP Address	Set the IP address of the DICOM commitment storage server. After the setting, click Ping to test the connectivity of the system.

Item	Description
DICOM AE Title	Set the Application Entity (AE) title of the DICOM commitment storage server.
Port Number	Set the port number of the DICOM commitment storage server.
Connect Timeout(sec)	Set the period of network connection timeout.
Repeat Count	Set the repeated times of connecting the DICOM commitment storage server.
Dimse Timeout(sec)	Set the timeout time of connecting the Dimse protocol.
Acse Timeout(sec)	Set the timeout time of connecting Acse protocol.
Synchronously Receive N-EVENT-REPORT Message	Tick this item, the system receives the N-EVENT-REPORT messages synchronously.

Click **Echo** to verify the connection between the ultrasound system and the DICOM commitment storage server after you make settings about the **Remote HostName**, **IP address**, **DICOM AE Title**, **Port Number**. A summary displays if the connectivity is verified.

4.4.3 DICOM Worklist Settings

You can connect the ultrasound system to the DICOM worklist server by setting this menu.

The screenshot shows the 'System Setting' window with the 'DICOM' tab selected. The 'Worklist' sub-tab is active, displaying the 'DICOM Worklist' settings. The 'Service List' dropdown is set to 'Worklist'. The settings include:

- Remote HostName: Worklist
- IP Address: 192.168.254.104 (with a Ping button)
- DICOM AE Title: AE (with an Echo button)
- Port Number: 105
- Connect Timeout(sec): 10
- Repeat Count: 1
- Dimse Timeout(sec): 10
- Acse Timeout(sec): 30
- Max. Result: 100

Buttons for 'Add', 'Delete', and 'Apply' are also visible.

Figure 4-11 Worklist Settings Menu

Item	Description
Service List	Select the DICOM worklist server. Click Add to add a new server and click Delete to delete a server.
Remote HostName	Set the name of the DICOM worklist server.
IP Address	Set the IP address of the DICOM worklist server. After the setting, click Ping to test the connectivity of the system.
DICOM AE Title	Set the Application Entity (AE) title of the DICOM worklist server.
Port Number	Set the port number of the DICOM worklist server.
Connect Timeout(sec)	Set the period of network connection timeout.
Repeat Count	Set the repeated times of connecting the DICOM worklist server.
Dimse Timeout(sec)	Set the timeout time of connecting the Dimse protocol.
Acse Timeout(sec)	Set the timeout time of connecting Acse protocol.
Max. Result	Set the maximum number of patient information can be sent to the ultrasound system.

Click **Echo** to verify the connection between the ultrasound system and the DICOM worklist after you make settings about the **Remote HostName**, **IP address**, **DICOM AE Title**, **Port Number**. A summary displays if the connectivity is verified.

4.4.4 MPPS Settings

You can connect the ultrasound system to the MPPS server by setting this menu.

The screenshot shows the 'System Setting' dialog box with the 'MPPS' tab selected. On the left is a sidebar with buttons: General, Peripheral, Measure, DICOM (highlighted), Load Default, and About. Below these is an 'Exit' button. The main area has a top row of tabs: Store, C-Store, Worklist, MPPS, and Print. Below the tabs is a 'Service List' section with a dropdown menu showing 'MPPS', and 'Add' and 'Delete' buttons. A 'DICOM MPPS' section contains the following fields and buttons:

- Remote HostName: Text box with 'MPPS'
- IP Address: Text box with '192.168.254.104' and a 'Ping' button
- DICOM AE Title: Text box with 'AE' and an 'Echo' button
- Port Number: Text box with '109'
- Connect Timeout(sec): Text box with '10' and Repeat Count: Text box with '2'
- Dimse Timeout(sec): Text box with '10' and Acse Timeout(sec): Text box with '30'

An 'Apply' button is located at the bottom right of the main area.

Figure 4-12 MPPS Settings Menu

Item	Description
Service List	Select the MPPS server. Click Add to add a new server and click Delete to delete a server.
Remote HostName	Set the name of the MPPS server.
IP Address	Set the IP address of the MPPS server. After the setting, click Ping to test the connectivity of the system.
DICOM AE Title	Set the Application Entity (AE) title of the MPPS server.
Port Number	Set the port number of the MPPS server.
Connect Timeout(sec)	Set the period of network connection timeout.
Repeat Count	Set the repeated times of connecting the MPPS server.
Dimse Timeout(sec)	Set the timeout time of connecting the Dimse protocol.
Acse Timeout(sec)	Set the timeout time of connecting Acse protocol.

Click **Echo** to verify the connection between the ultrasound system and the MPPS server after you make settings about the **Remote HostName**, **IP address**, **DICOM AE Title**, **Port Number**. A summary displays if the connectivity is verified.

4.4.5 Print Service Settings

You can connect the ultrasound system to the print service server by setting this menu.

The screenshot shows the 'System Setting' window with the 'Print' tab selected. The 'Service List' contains 'DicomPrint'. The 'DicomPrint' section has the following settings: Remote HostName: DicomPrint, IP Address: 192.168.254.104, DICOM AE Title: AE, Port Number: 109, Connect Timeout(sec): 10. The 'Properties' section includes: Format: 1×1, Trim: YES, Priority: MED, Border: WHITE, Medium: PAPER, Empty Image: WHITE, Orientation: PORTRAIT, Color: Gray, Film Size: A4, Min Density: 20, Film Destination: MAGAZINE, Max Density: 320, Magnification: CUBIC, Configure Information: (empty), Copies: 1, Film Session Label: (empty), Smoothing Type: 1. An 'Exit' button is at the bottom left, and an 'Apply' button is at the bottom right.

Figure 4-13 Print Service Settings Menu

Item	Description
Service List	Select the DICOM print server. Click Add to add a new server and click Delete to delete a server.
Remote HostName	Set the name of the DICOM print server.
IP Address	Set the IP address of the DICOM print server. After the setting, click Ping to test the connectivity of the system.
DICOM AE Title	Set the Application Entity (AE) title of the DICOM print server.
Port Number	Set the port number of the DICOM print server.

Item	Description
Format	Set the print format. Choose from: 1×1, 1×2, 2×1, 2×2, 2×3, 2×4, 3×3, 3×4, 3×5, 4×4, 4×5, 4×6 or 5×6 .
Trim	Set to print or not print a crop box around each image.
Priority	Set the print job priority. Choose from: LOW, MED or HIGH
Border	Set the color of the border to fill the gap between the images. Choose from: BLACK or WHITE .
Medium	Select the print medium. Choose from: BLUE FILM, CLEAR FILM or PAPER
Empty Image	Set the color of the empty images. Choose from: BLACK or WHITE .
Orientation	Set the print orientation. Choose from: PORTPAIT or LANDSCAPE
Color	Set the color of the image. Choose from: Color or Gray .
Film Size	Set the film size. Choose from: 8INx10IN, 8.5INx11IN, 10INx12IN, 10INx14IN, 11INx14IN, 11INx17IN, 14INx14IN, 14INx17IN, 24CMx24CM, 24CMx30CM, A4 or A3 .
Min Density	Set the minimum density level of the film.
Film Destination	Set the film destination. Choose from: MAGAZINE or PROCESSOR <ul style="list-style-type: none"> ■ Set it to MAGAZINE, image will be stored in a film magazine. ■ Set it to PROCESSOR, image will be processed in a film processor.
Max Density	Set the maximum density level of the film.
Magnification	Set the method used for magnifying images during the print. Choose from: PEPLICATE, BILINEAR, CUBIC or NONE .
Configure Information	Make special image quality settings.

Item	Description
Copies	Set the number of copies to print.
Film Session Label	Enter a name to be applied on a group of the film labels.
Smoothing Type	Set the value of magnification interpolation for the printer.

Click **Echo** to verify the connection between the ultrasound system and the DICOM print server after you make settings about the **Remote HostName**, **IP address**, **DICOM AE Title**, **Port Number**. A summary displays if the connectivity is verified.

4.5 Defining System Defaults

You can define your system defaults by configuring this menu.

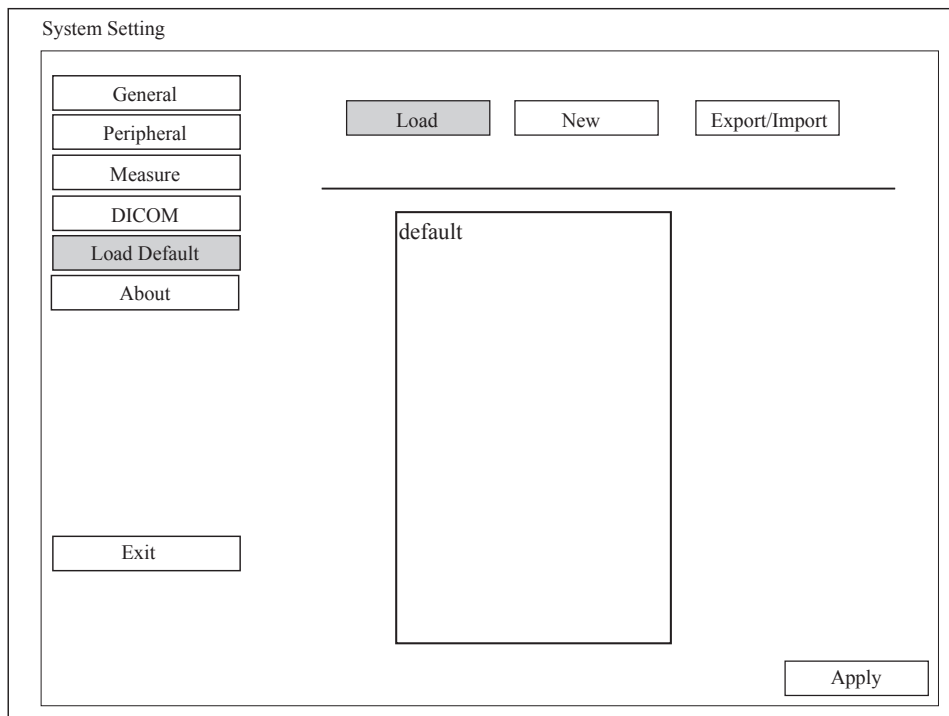


Figure 4-14 Loading Defaults Menu

■ To load system defaults

1. Click **Load**, select a setting name, and then the following dialogue box appears.
2. Type **Y** on the control panel to confirm the loading;
Type **N** to cancel the loading.
Select **Delete** on the control panel to delete the system defaults.
3. Select **OK** to confirm it.

■ To create system defaults

Click **New**, enter a setting name in the text box. The created setting name will be listed on the Loading Defaults Menu.

To export or import system defaults

Click **Export/import** to enter the following menu.

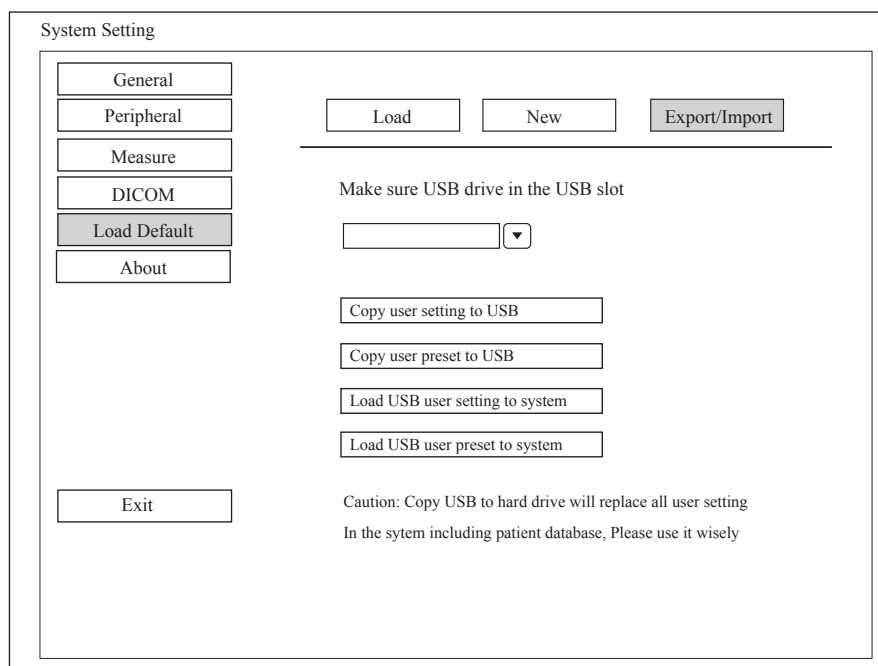


Figure 4-15 Exporting or Importing Defaults Menu

Ensure the USB device is connected to the ultrasound system before export or import the system defaults.

- Click **Copy user setting to USB** to back up the system defaults to the USB device.
- Click **Copy user preset to USB** to back up the customized system defaults to the USB device.
- Click **Load USB user setting to system** to copy the system settings to the ultrasound system.
- Click **Load USB user preset to system** to copy the customized system to the ultrasound system.

4.6 Viewing System Information

Select the **Menu** key on the control panel and select **About** on the pop-up menu.

You can view the current hardware version, the software version and the control number. The Control Number is an unique number for the ultrasound system.

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Chapter 5 Preparing for an Exam

You can start an exam without entering any patient information. However, the patient's name and ID is closely related with each patient's image. To avoid patient identification errors, you should always verify the identification with the patient.

5.1 Acquiring Patient Information

You can acquire the patient information in the following ways:

- Create new patient information
- Retrieve archived patient information
- Receive patient information using DICOM worklist

5.1.1 Beginning a New Patient

Select the **Patient** key on the control panel to display the **Patient Information** screen in Figure 5-1.

Figure 5-1 Patient Information Screen

NOTE:

You can move the cursor by using the trackball, and then select the **Set** key on the control panel to select the desired item.

Perform the following steps to begin a new patient.

1. Enter relevant patient information

Patient ID Enter manually the patient ID, special characters are prohibited to be entered.

Patient ID will be automatically generated without any inputs according to the current system time.

NOTE:

Patient ID is an important identification, once it is saved, you cannot modify it.

Name	Enter manually first name, middle name or last name of the patient.
DOB	Enter manually the date of birth for the current patient. You can set Date Format on the General menu.
Age	The patient's age will be automatically calculated if you enter the information in the DOB textbox.
Sex	Enter manually the gender for the current patient.
Accession#	Enter manually the exam ID for the current patient, special characters are prohibited to be entered.
Weight and Height	Enter manually the weight and height for the current patient.
BSA	The system will automatically calculate the body surface area after you entering the weight and height. You can select the calculation formula from using the corresponding drop-down list
BP	Enter manually the blood pressure for the current patient.
Comments	Make comments for the current patient.

2. Select the exam type

Exam type	Select an exam type for the current patient, including Abdomen, Obstetrics, Gynecology, Cardiology, Vascular, Urology, Small Parts, Pediatrics, Musculoskeletal, Neurology, Orthopedics and others.
Description	Enter manually the information related to the exam type.
Primary Indications	Enter the related information manually.
Secondary Indications	Enter the related information manually.

NOTE:

- You must enter the height and weight for the current patient when you select Cardiology as the exam type. **BSA** will be automatically calculated in accordance with **BSA** set on the **Measure** menu.
- You must enter the height and weight for the current patient when you select Obstetrics as the exam type. **AUA** will be automatically calculated.

3. Enter the related operating information

Referring.M.D/Performing.M.D/	Enter manually the name.
Sonographer	
Comment	Enter manually the notice or necessary information.

4. Click **OK** to save the modifications.

If the last patient exam is not completed, the system will remind you to complete or discontinue the exam. For details, refer to Section 5.4.2 Discontinuing an Exam.

5.1.2 Retrieving Archived Information

You can retrieve the archived information by choosing the **Patient** key -> **Patient List** -> **Exam Review**.

Patient Exam List

Patient ID Last Name Age

Date 05/04/2014 To 05/05/2014 First Name Sex

Current Exam

DICOM Queue

Import/Export

Export Screen

HD: 2.17G/160G

Exam Type	Exam Date/Time	Description	Sonographer	Image Size	Store State
Canine	05/05/2014-16:04:03			40.82M	

Figure 5-2 Exam Review Screen

Perform the following steps to retrieve information.

1. Search for the archived information

Enter the search requirements, such as Patient ID, First/Last Name, Sex, Exam Date/Time or Age, and then click **Search** to search the desired one.

Patient Exam List

Patient ID Last Name Age

Date 05/04/2014 To 05/05/2014 First Name Sex

Current Exam

DICOM Queue

Import/Export

Export Screen

HD: 2.17G/160G

Patient ID	Patient Name	Birth Date	Sex	Exam Date/Time	Image Size
20140505	Mary	Unknown		05/05/2014-16:04:03	40.82M

2. Select the desired information
Move the cursor on the desired information, and select the **Set** key on the control panel to select it.
3. Exam the desired patient
Click **New Exam** to start an new exam.

5.2 Using DICOM Worklist

You can acquire the patient information using the DICOM worklist if the ultrasound system is configured with the DICOM module. For details, refer to Section 11.4 DICOM Worklist.

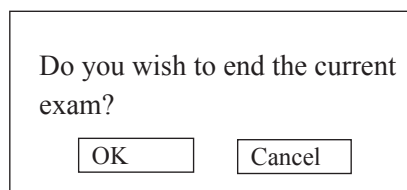
5.3 Pausing/Ending an Exam

- To pause an exam
 1. Select the **Patient** key on the control panel to enter the **New Patient** screen, and then click **Patient List -> Exam Review** to enter the **Exam Review** screen.
 2. Select the current exam, and then click on **Suspend Exam** to pause the exam.
- To resume an exam
 1. Select the **Patient** key on the control panel to enter the **New Patient** screen, and then click **Patient List -> Patient Review** to enter the **Patient Review** screen.
 2. Select the desired patient information, and then click on **View** to enter the **Exam Review** screen.
 3. Select the desired exam, and then click on **Resume Exam** to resume the exam.

5.4 Completing/Discontinuing an Exam

5.4.1 Completing an Exam

1. Select the **End Exam** key on the control panel.
A dialogue box pops up as follows:



2. Click **OK** to end the exam.

5.4.2 Discontinuing an Exam

1. Select the **Patient** key on the control panel to enter the **New Patient** screen, enter the current patient information, and then click **OK**.

A dialogue box pops up as follows:

PPS

☐ Assisted Acquisition Protocol Setting

Code

Meaning

Designator

Reason ▼

If you tick **Assisted Acquisition Protocol Setting**, you can send the last patient information to MPPS after entering the relevant information to code, meaning and designator.

2. Select the reason from the corresponding drop-down list, and then click on **Discontinued**.

Chapter 6 Acquiring Images

You can acquire images by optimizing the relevant parameters for clinical diagnosis.

6.1 Selecting a Probe and an Exam Type

Once the ultrasound system is started up, the LCD monitor displays the available probes and the exam types (as shown in Figure 6-1). You can select the desired probe by using the trackball. You can also select the **Exam** key to enter the application mode screen from other screens.

NOTE:

Ensure probe types displayed on the LCD monitor are consistent with the actual probes. If there are incorrect or no probe types displayed, insert the probe connector into the probe port firmly. If problem still exists, please stop using the ultrasound system immediately and contact the manufacturer.

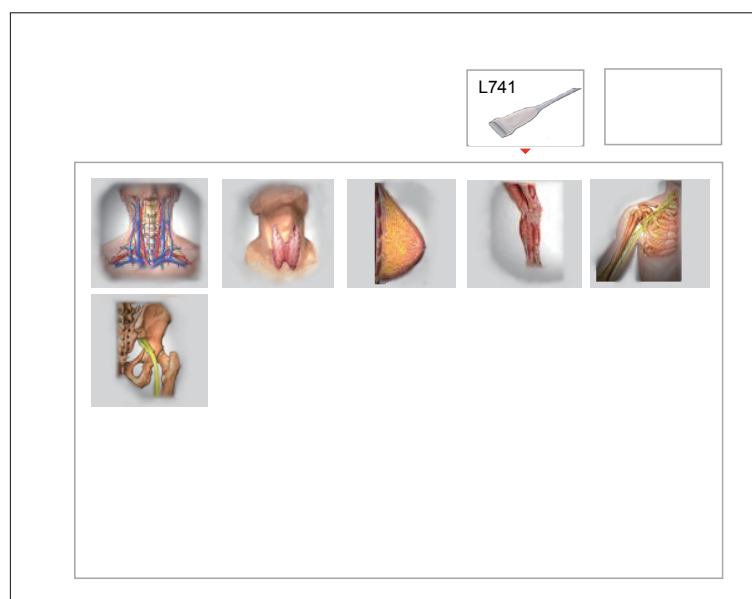


Figure 6-1 Application Mode Screen

You can also make modifications in an exam type and save them as an application preset for future use. Moreover, the layout of the application mode screen can be modified and factory defaults can be restored.

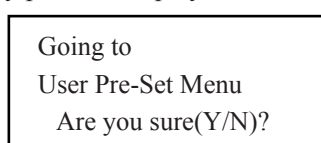
■ To customize a preset

1. Select the desired probe and exam type.
2. Select an imaging mode and optimize the image.

NOTE:

The parameter optimizing is only available for the current imaging mode.

3. Select the **S** key on the key panel to display the following dialogue box.



4. Select the **Y** key to enter the **User preset** screen, as shown in Figure 6-2.

Figure 6-2 User Preset Menu

5. Enter the name of the application preset in the textbox under the Input new exam name textbox.
 - Click or beside **ExamType** to select the template for the application preset.
 - Click or beside **ExamIcon** to select the icon for the application preset.
6. Click **Create Exam** to create the application preset.

Click **Exit**, and the application preset you customized displays on the LCD monitor.

■ To arrange presets display

Click **Edit exam** to arrange presets display. The customized application presets, not the system application presets, can be also deleted.

NOTE:

An exam type suffixed with s is a system application preset, suffixed with u is a customized application preset.

The interface is titled 'Preset Display Screen'. On the left, there is a vertical stack of four buttons: 'Create new exam', 'Edit exam' (which is highlighted with a grey background), 'Factory data reset', and 'Exit'. To the right of these buttons is a larger rectangular area. Inside this area, at the top left, is the text 'Preset exam:'. Below this text is a table with 10 rows. The first four rows contain the text 'Cardiology(s)', 'Liver(s)', 'Granial(s)', and 'Difficult(s)' respectively. The fifth row contains 'new(u)'. The remaining five rows are empty. To the right of the table are three buttons: 'UP', 'DOWN', and 'Delete'. At the bottom of the right-hand area are two buttons: 'Save' and 'Cancel'.

Create new exam
Edit exam
Factory data reset
Exit

Preset exam:

Cardiology(s)
Liver(s)
Granial(s)
Difficult(s)
new(u)

UP
DOWN
Delete

Save Cancel

Figure 6-3 Preset Display Screen

- Select an exam type in the table list, click **UP** or **DOWN** to arrange the preset on the application mode screen, and then click **Save** to save the modification.
 - Click one desired application preset suffixed with u, and click **Delete** -> **YES** to delete the application preset.
- To restore defaults
Click **Factory data reset** and click **YES** in the pop-up dialogue box to restore defaults.

6.2 Acquiring B-Mode Images

B-mode imaging is intended to provide information of anatomical structure of soft tissue.

6.2.1 Entering B Mode

The system enters B mode by default after you select a probe model and an exam type.

You can select **B** on the control panel to enter B mode from other imaging modes.

The basic screen in the B mode displays as follows:

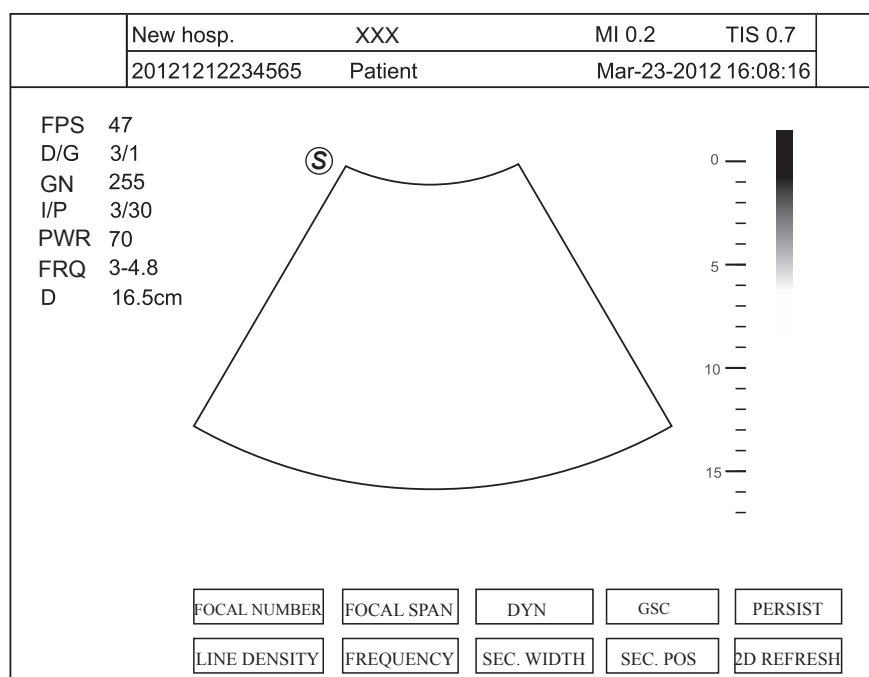


Figure 6-4 B-Mode Imaging Screen

For details on operating the basic screen, refer to Section 2.3.6 Basic Screen.

6.2.2 Optimizing B-Mode Images

After entering the B mode, the imaging parameters display at the bottom of the LCD monitor as shown in Figure 6-4, you can use them to optimize B-mode images.

You can adjust other parameters and select display modes on the pop-up menu by select the **Menu** key.

NOTE:

All parameters can only be adjusted in a real time B mode, but **Chroma** and **GSC** can also be adjusted in the frozen mode.

6.2.2.1 Gain

The B mode gain (2D gain) determines the amplifying factors for the received echoes and the brightness of the ultrasound image. The echoes are amplified with the same gain value regardless of depth.

To adjust the gain:

- Rotate the **B** knob clockwise to increase the value.
- Rotate the **B** knob anticlockwise to decrease the value.

6.2.2.2 TGC

TGC (Time Gain Compensation) is used to adjust the gain that allows compensation for attenuation of the echoes over time (depth). It is adjustable during the real time scan regardless of the imaging mode and display format.

TGC balances the image so that the density of echoes is the same throughout the image.

To adjust TGC:

- Move the TGC slide pot left to decrease the value.
- Move the TGC slide pot right to increase the value.

NOTE:

- Modifications of TGC values cannot be saved if you shift to use another imaging mode.
- TGC curve displays in the right corner of the imaging area when you adjust TGC values, and the curve disappears if TGC values are not adjusted more than 3 seconds.

6.2.2.3 Focal Position/Number/Span

It is used to adjust the depth range of the ultrasound beam, the focus number and the focal span. The focus identified by a red triangle displays in the right corner of the image.

Focus optimizes the image by increasing the resolution for a specific area.

To adjust focal position/number/span:

- Flip the **FOCUS** switch to adjust the depth of focal zone(s).
- Select **FOCAL NUMBER** by pressing the corresponding function key, and rotate it to adjust the value.
- Select **FOCAL SPAN** by pressing the corresponding function key, and rotate it to adjust the value.

6.2.2.4 Depth

Depth is used to adjust the distance over which the B-Mode image is anatomized.

To adjust the depth:

- Flip the **DEPTH** switch upwards to decrease the depth range of the 2D image and the size of image is magnified.
- Flip the **DEPTH** switch downwards to increase the depth range of the 2D image and the ultrasound image is reduced.

NOTE:

- The number of frame rate varies with the depth.
- The range of the scanning depth varies with the probe. D (depth) displays in the 2D Image Info area.

6.2.2.5 Frequency

The probe is capable of generating a broadband signal with a certain start frequency and a certain bandwidth. The higher frequency brings about the higher resolution and the lower penetration.

To adjust the frequency:

1. Select **FREQUENCY** by pressing the corresponding function key.
2. Rotate it clockwise or anticlockwise to adjust the value.

6.2.2.6 Chroma

Chroma is used to colorize the gray scale image to enhance the discrimination capability. There are 13 colors available.

To adjust the chroma:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.
2. Select **CHROMA** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to make the setting.

6.2.2.7 Compound Imaging

Compound imaging is used to acquire a series of overlapping image frames from substantially differing spatial directions and combining these images to reduce speckle and improve contrast resolution.

To use compound imaging:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen
2. Select **COMPOUND** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to enable or disable the feature.

6.2.2.8 Line Density

Line density refers to the amount of ultrasound beam that makes up the image. Increasing the value of line density improves the resolution and decreases frame rate. Therefore, you have to balance the frame rate and the image quality when adjusting the line density.

A higher line density is useful in obtaining very high resolution, such as thyroid, testicles. A lower line density is useful in fetal heart beat, adult cardiac applications and in clinical Radiology applications.

To adjust the line density:

1. Select **LINE DENSITY** by pressing the corresponding function key.
2. Rotate it to make the setting.

6.2.2.9 Persistence

Persistence is used to average consecutive frames to provide a smoother appearance with less noise. Use lower persistence values for fast-moving organs or tissues and higher persistence values for smoother appearance.

To adjust the persistence:

1. Select **PERSIST** by pressing the corresponding function key.
2. Rotate it to adjust the value.

6.2.2.10 Dynamic Range

Dynamic Range increases the adjustable range of contrast by enhancing the intensities of parts of the grayscale. It optimizes the ultrasound image texture.

To adjust the dynamic range:

1. Select **DYN** by pressing the corresponding function key.
2. Rotate it to adjust the value.

6.2.2.11 Grayscale Curve

Grayscale curve optimizes the brightness of each pixel in accordance with the corresponding echo.

To adjust the grayscale curve:

1. Select **GSC** by pressing the corresponding function key.
2. Rotate it to adjust the value.

6.2.2.12 Adaptive Image Fusion

Adaptive image fusion provides choices of optimization methods for improving image quality through boundary enhancement, image smoothing and system optimization.

To adjust the adaptive image fusion:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.
2. Select **ADAPT. IM FUSION** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to increase or decrease the value.

6.2.2.13 Sector Position/Width/Angle

Sector width (for linear probes) or sector angle (for curved and phased probes) is used to adjust the frame rate. You can adjust the sector width or angle to get more information without moving the probe.

The interest imaging area of the object can be adjusted after you adjust the sector width or sector.

To adjust the sector position/width/angle:

- Select **SEC.POS** by pressing the corresponding function key and rotate it to horizontally move or rotate the interest area.
- Select **SEC.WIDTH** by pressing the corresponding function key and rotate it to increase or decrease the width or angle of the interest area.

6.2.2.14 Power

Power is used to select the amount of ultrasound acoustic power produced by the probe in the B mode. The adjustment range of the power is 1-100%, and ±1% can be adjusted each time. The real time value of the power is displayed in the imaging information area of the basic screen.

To adjust the power:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.
2. Select **POWER %** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to increase or decrease the value.

NOTE:

Expose the patient to the lowest practical transmit power level for the shortest possible time to achieve a satisfactory diagnosis.

6.2.2.15 Tissue Acoustic Characteristics

Tissue acoustic characteristics refer to the speed of ultrasound passing through the tissue. Tissue acoustic characteristics optimize the image used for measurements and calculations. The greater tissue acoustic characteristics bring about the quicker speed of ultrasound.

To adjust tissue acoustic characteristics:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.
2. Select **TISSUE ACOUSTIC** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to increase or decrease the value.

6.2.2.16 Image Rotation

You can rotate the image to get more information. This item is applicable in transvaginal and transrectum scan.

To rotate the image:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.
2. Select **IMAGE ROTATE** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to increase or decrease the rotation angle.

NOTE:

Note that the depth calibration displays at the bottom of the basic screen when the image is rotated 90° or 270°.

6.2.2.17 μScan

μScan is used to improve the image quality.

To use μScan:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.
2. Select **μScan** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to increase or decrease the value.

NOTE:

Ensure the dongle is inserted before you enable μScan feature.

6.2.2.18 Trapezoidal Imaging

Trapezoidal imaging is used to enlarge the imaging area when performing a real time scan by using the linear probes.

To use trapezoidal imaging:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.
2. Select **TRAPEZOID** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to enable or disable the feature.

6.2.2.19 Steer

Steer can be adjusted to change the direction of the acoustic beam when performing a real time scan by using the linear probes.

To adjust the steer:

Flip the **STEER** switch to change the direction of the acoustic beam.

NOTE:

Only the linear probes are available when adjusting the steer.

6.3 Acquiring Color Flow Images

Color Flow imaging adds the color-coded qualitative information in the B-Mode image. Color Flow imaging is helpful to see the flow, the relevant qualitative information and the flow velocity.

6.3.1 Color Mode

Color is a color flow imaging technology which adds the color-coded qualitative information concerning the relative velocity and direction of fluid motion in the B-Mode image.

Perform the following steps to acquire Color-mode images.

1. Optimize a B-mode image.
2. Select **C** on the control panel to enter the Color mode.

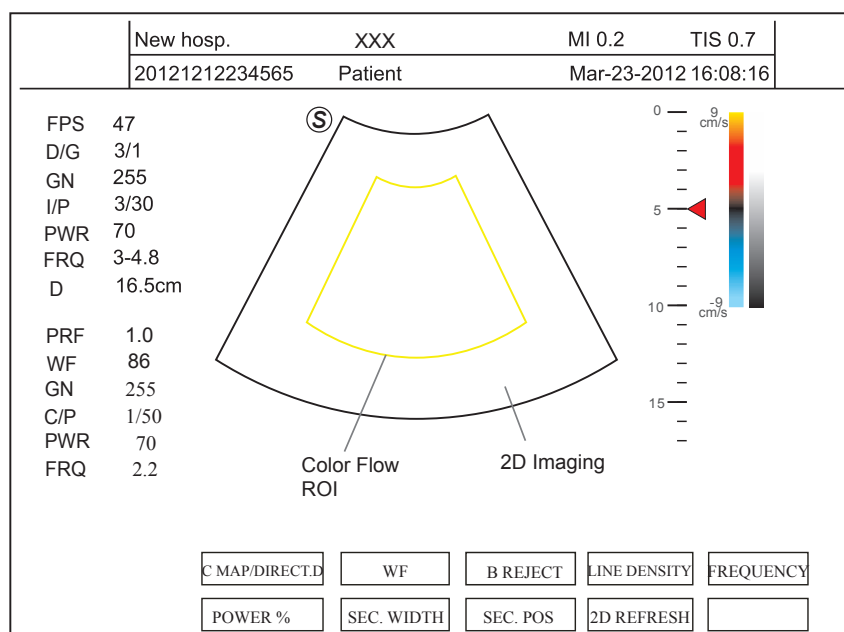


Figure 6-5 Color-Mode Imaging Screen

3. Adjust Color Flow ROI.
 - a. Move the trackball to position Color Flow ROI.
 - b. Select the **Set** key to adjust the size of Color Flow ROI.
 - c. Select the **Set** key to reposition Color Flow ROI.
4. Optimize the Color-mode image. For details, refer to Section 6.3.4 Optimizing Color/DPI/TDI Mode Images.
5. Select **C** on the control panel again to exit the screen.

6.3.2 DPI Mode

DPI (Doppler Power Imaging) is a color flow imaging technology which adds the flow signal in the Color-mode image. DPI uses the number and amplitude of red blood cell going through in the flow to create the color-coded imaging. The flow with slow velocity and small rate could be displayed in DPI. Therefore, the flow with a higher sensitivity can be detected without overlaying any flows with high velocity.

The direction of flow, the flow velocity and flow properties cannot be reflected in the DPI-Mode image.

Perform the following steps to acquire DPI-mode images:

1. Optimize a B-mode image.
2. Select **DPI** on the control panel to enter the DPI mode.

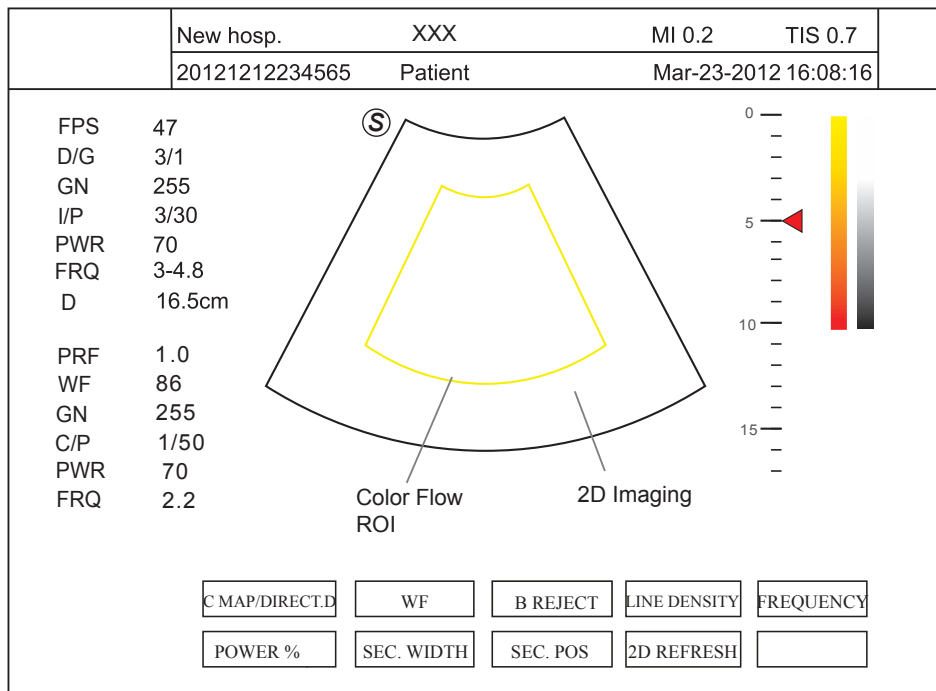


Figure 6-6 DPI-Mode Imaging Screen

3. Adjust Color Flow ROI.
 - a. Move the trackball to position Color Flow ROI.
 - b. Select the **Set** key to adjust the size of Color Flow ROI.
 - c. Select the **Set** key to reposition Color Flow ROI.
4. Optimize the DPI-mode image. For details, refer to Section 6.3.4 Optimizing Color/DPI/TDI Mode Images.
5. Select **DPI** again to exit the screen.

6.3.3 TDI Mode

NOTE:

TDI imaging is only applied to cardiac applications by using the phased probes.

TDI (Tissue Doppler Imaging) is a color flow imaging technique which detects the low frequency signal reflected from cardiac muscle. TDI provides the flow information of velocity and direction for cardiac movement.

TDI uses the low velocity and the high amplitude adjusted from the wall filter to create a color-coded tissue imaging.

Perform the following steps to acquire TDI-mode images.

1. Optimize a B-mode image.
2. Select **TDI** on the control panel to enter the TDI mode.

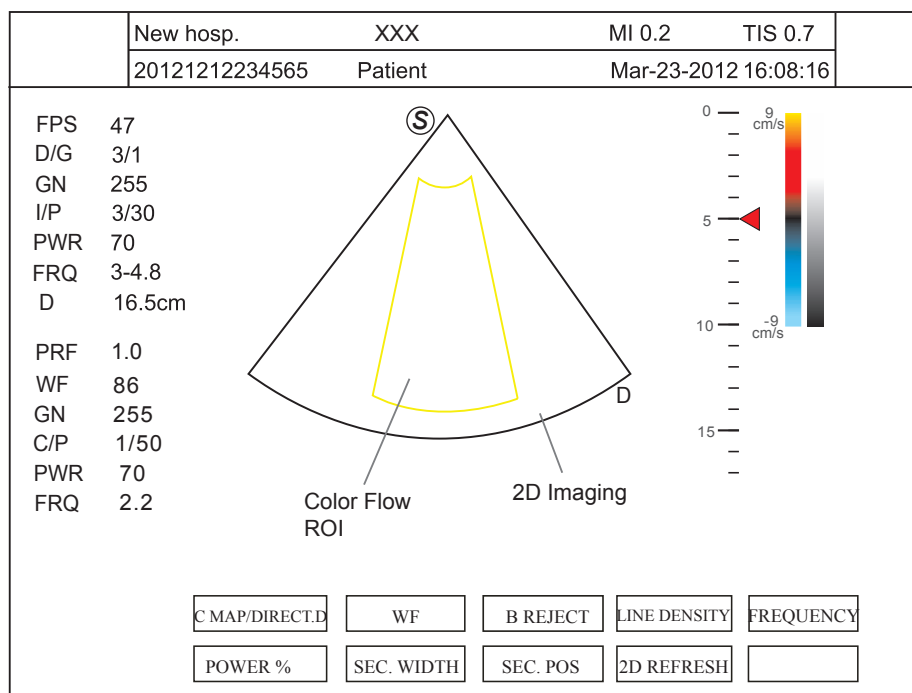


Figure 6-7 TDI-Mode Imaging Screen

3. Adjust Color Flow ROI.
 - a. Move the trackball to position Color Flow ROI.
 - b. Select the **Set** key to adjust the size of Color Flow ROI.
 - c. Select the **Set** key to reposition Color Flow ROI.
4. Optimize the TDI-mode image. For details, refer to Section 6.3.4 Optimizing Color/DPI/TDI Mode Images.
5. Select **TDI** again to exit the screen.

6.3.4 Optimizing Color/DPI/TDI Mode Images

After entering the Color/DPI/TDI mode, the imaging parameters display at the bottom of the LCD monitor as shown in Figure 6-5, you can use them to optimize B-mode images.

You can adjust other parameters and display modes on the pop-up menu by selecting the **Menu** key.

NOTE:

All parameters can only be adjusted in a real time Color/DPI/TDI mode, but **BASELINE**, **C MAP** and **B REJECT** can also be adjusted in the frozen mode.

6.3.4.1 Gain

Color flow gain optimizes the color flow continuous with less noises.

To adjust the gain:

- Rotate the **C** knob clockwise to increase the value.
- Rotate the **C** knob anticlockwise to decrease the value.

6.3.4.2 Frequency

Frequency optimizes the penetrability and the sensitivity of the color flow.

To adjust the frequency:

1. Select **FREQUENCY** by pressing the corresponding function key.
2. Rotate it to adjust the value.

6.3.4.3 Wall Filter

Wall filter is used to filter the low frequency noise from tissues, such as vascular wall.

To adjust the wall filter:

1. Select **WF** by pressing the corresponding function key.
2. Rotate it to adjust the value.

6.3.4.4 Pulse Repetition Frequency

Pulse repetition frequency is used to adjust the velocity scale.

To adjust the pulse repetition frequency:

- Flip the **PRF** switch upwards to increase the value.
- Flip the **PRF** switch downwards to decrease the value.

6.3.4.5 Line Density

Line density refers to the amount of ultrasound beam that make up the image. Increasing the value of line density improves the resolution and decreases frame rate. Therefore, you have to balance the frame rate and the image quality when adjusting the line density.

A lower line density is useful in fetal heart beat, adult cardiac applications and in clinical Radiology applications. A higher line density is useful in obtaining very high resolution, such as thyroid, testicles.

To adjust the line density:

1. Select **LINE DENSITY** by pressing the corresponding function key.
2. Rotate it to adjust the value.

6.3.4.6 Baseline

Baseline represents the position of zero velocity or frequency. The velocity range in one direction can be increased or decreased by adjusting the baseline.

Baseline is used to unwraps the alias in the color flow imaging, and display higher velocities without reversal of colors.

To adjust the baseline:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.
2. Select **BASELINE** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to move the baseline towards positive or negative direction.

NOTE:

This function is not available in the DPI mode.

6.3.4.7 Color Map

Color map is used to select the method for the color-coding of blood flows.

To change the color map:

1. Select **C MAP/DIRECT.D** by pressing the corresponding function key.
2. Rotate it to adjust the value.

NOTE:

When **C MAP/DIRECT.D** is set to 4 or above in the DPI mode, the system automatically enters the DDPI mode with a **Directional DPI** icon. At this time, you can view the flow direction and velocity.

6.3.4.8 Persistence

Persistence is used to average consecutive frames to provide a smoother appearance with less noise. Use lower persistence values for fast-moving organs or tissues and higher persistence values for smoother appearance.

To adjust the persistence:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.
2. Select **PERSIST** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to increase or decrease the value.

6.3.4.9 Sector Position/Width/Angle

Sector width (for linear probes) or sector angle (for curved and phased probes) is used to adjusted the frame rate. You can adjust the sector width or angle to get more information without moving the probe.

The interest imaging area of the object can be adjusted after you adjust the sector width or sector.

To adjust the sector position/width/angle:

- Select **SEC.POS** by pressing the corresponding function key and rotate it to horizontally move or rotate the interest area.
- Select **SEC.WIDTH** by pressing the corresponding function key and rotate it to adjust the width or angle of the interest area.

6.3.4.10 Power

Power is used to select the amount of ultrasound acoustic power produced by the probe. The adjustment range of the power is 1-100%, and ±10% can be adjusted each time. The real time value of the power is displayed in the imaging information area of the basic screen.

To adjust the power:

1. Select **POWER %** by pressing the corresponding function key.
2. Rotate it to adjust the value.

NOTE:

Expose the patient to the lowest practical transmit power level for the shortest possible time to achieve a satisfactory diagnosis.

6.3.4.11 B Reject

B reject is used to set the display priorities of the color and 2D grayscale pixels. Larger B Reject value suppresses more grayscale pixels.

To adjust B reject:

1. Select **B REJECT** by pressing the corresponding function key.
2. Rotate it to adjust the value.

6.3.4.12 Steer

Steer is used to adjust the angle of CF ROI when performing a real time scan by using the linear probes.

To adjust the steer:

- Flip the **STEER** switch left to rotate the ROI clockwise.
- Flip the **STEER** switch right to rotate the ROI anticlockwise.

NOTE:

Only the linear probes are available when adjusting the steer.

6.3.4.13 Flow Invert

Flow invert is used to view blood flow from a different perspective.

When **Flow Invert** is set to **OFF**, red pixels represent flow to the probe; blue pixels represent flow away from the probe.

When **Flow Invert** is set to **ON**, blue pixels represent flow to the probe; red pixels represent flow away from the probe.

To enable or disable the flow invert:

Select **Invert** to enable or disable the feature.

NOTE:

The color flow and the color map are also inverted when reversing the flow.

6.4 Acquiring M-Mode Images

M mode is generally used with 2D imaging, and is helpful for cardiac applications. In the M mode, you can position the M-line in the 2D image on the anatomy of interest, and then learn about the tissue motion along that line in an M-mode trace. In M-mode, y-axis is used to display the position or depth of the tissue, and x-axis is the time scale.

6.4.1 M Mode

The M-line can be only positioned 90° within the ultrasound beam. Therefore, the M mode is used to view motion patterns for regular objects.

Perform the following steps to acquire M-mode images.

1. Optimize a B-mode image.
2. Select **M** on the control panel to enter the inactivated B+M mode.
The basic screen is divided into two displays as the following figure shows.

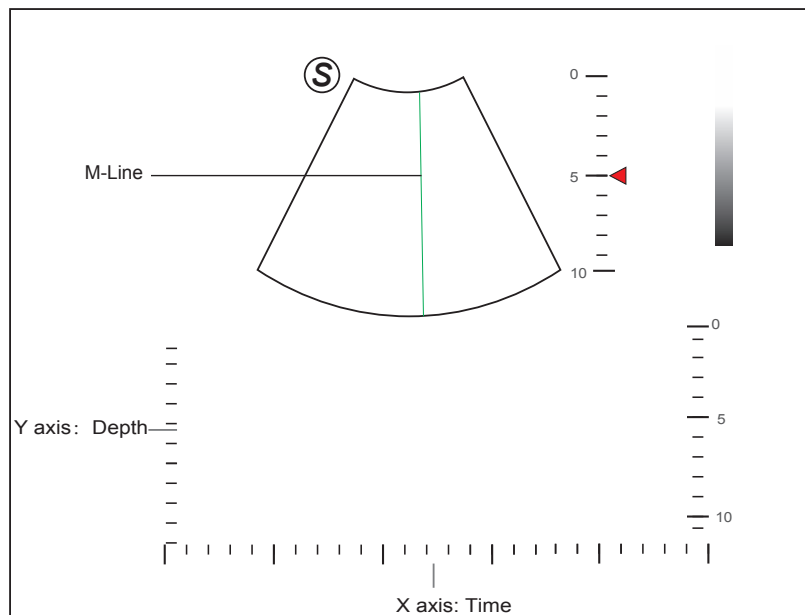


Figure 6-8 Inactivated B+M-Mode Imaging Screen

The M-mode cursor is used to position the M-line.

■ X-axis is the time scale.

■ Y-axis is the depth scale.

3. Adjust the M-mode cursor by using the trackball.

4. Select the **Update** key to activate the M mode.

The basic screen displays as below after being activated.

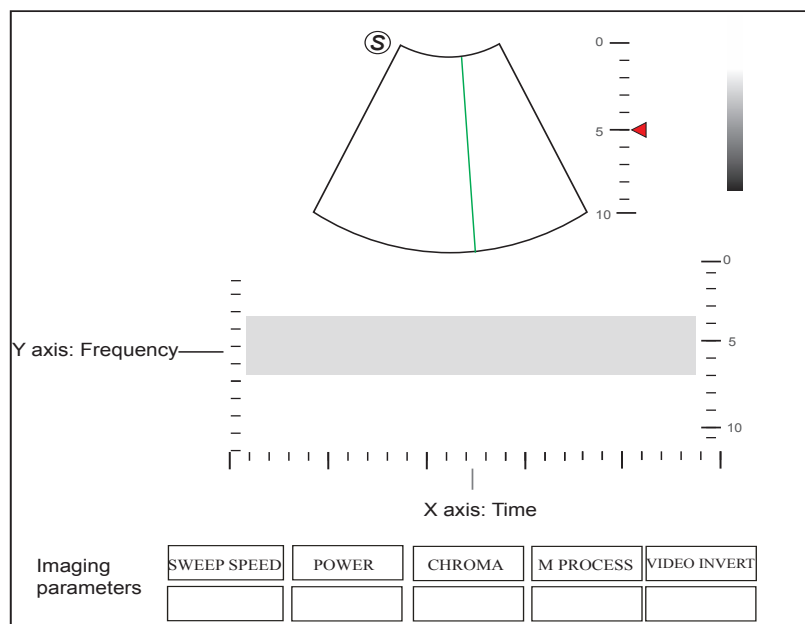


Figure 6-9 M-Mode Imaging Screen

NOTE:

Once the M mode is activated, you can move the trackball to stop the M trace and adjust the M-mode cursor. You can also continue tracing without moving the trackball more than 0.5 second.

5. Optimize M-mode image. For details, refer to Section 6.4.3 Optimizing M-Mode Images.

6. Select **M** to exit.

6.4.2 Anatomical M-Mode

Anatomical M-mode is used for fetal cardiac applications. Anatomical M-mode can be used with phases array probes when performing cardiac exams or convex probes when performing abdomen exams. In the anatomical M-mode, the M-mode cursor can be positioned perpendicular to the anatomical structure and be adjusted 360° even when viewing motion patterns for irregular objects. It is used to study the ventricular function of the heart.

Perform the following steps to acquire anatomical M-mode images.

1. Enter the inactivated B+M mode, and select the **Menu** key. A menu pops up on the screen.
2. Select **STEER M** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to increase or decrease the value.
Multiple M-lines display after making setting as the following figure shows.

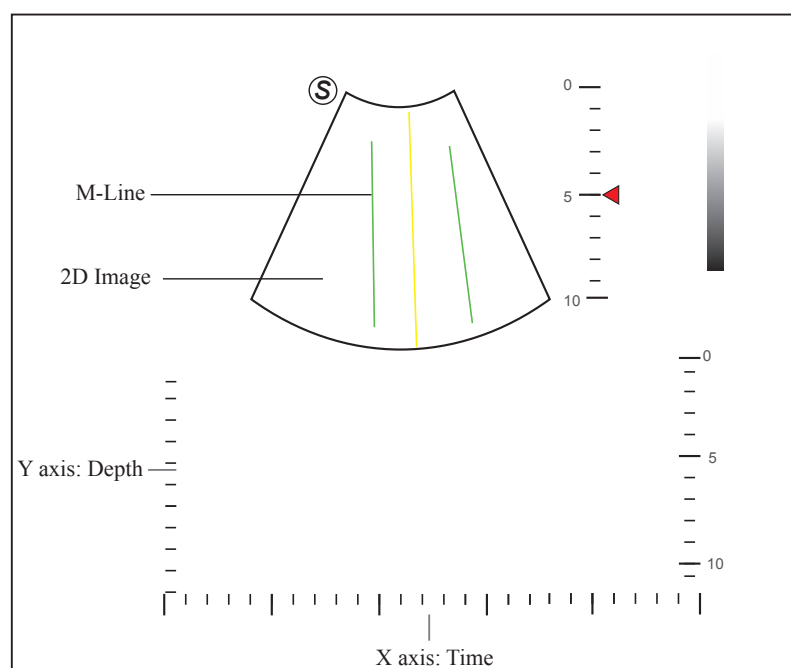


Figure 6-10 Inactivated Anatomical M-Mode Imaging Screen

4. Adjust the position and the angle of M-mode cursor.
 - a. Position the desired M-line by using the trackball.
 - b. Select the **Set** key to select the desired M-line.
5. Select the **Update** key to activate the anatomical M-mode.

NOTE:

Once the anatomical M-mode is activated, anatomical M-mode imaging will display on the X-axis and Y-axis.

6. Optimize anatomical M-mode images. For details, refer to Section 6.4.3 Optimizing M-Mode Images.
7. Select **M** to exit.

6.4.3 Optimizing M-Mode Images

After activating the M trace, the imaging parameters display at the bottom of the LCD monitor as shown in Figure 6-9, you can use them to optimize B-mode images.

You can adjust other parameters and display modes on the pop-up menu by selecting the **Menu** key.

NOTE:

All parameters can only be adjusted in a real time M mode, but **Chroma** and **Display Format** can also be adjusted in the frozen mode.

6.4.3.1 Gain

M gain controls the overall brightness of the M trace.

To adjust the gain:

- Rotate the **B** knob clockwise to increase the value.
- Rotate the **B** knob anticlockwise to decrease the value.

6.4.3.2 M Process

M process is used to set the processing method for the M trace display.

To set M process:

1. Select **M PROCESS** by pressing the corresponding function key.
2. Rotate it to make the setting.

6.4.3.3 Sweep Speed

Sweep speed is used to set the sweep speed of the M trace. Faster speed is suitable to view the motion.

To adjust the sweep speed:

1. Select **SWEEP SPEED** by pressing the corresponding function key.
2. Rotate it to adjust the value.

6.4.3.4 Chroma

Chroma is used to colorize the gray scale image to enhance the discrimination capability. There are 5 colors available.

To adjust the chroma:

1. Select **CHROMA** by pressing the corresponding function key.
2. Rotate it to make the setting.

6.4.3.5 Display Format

Display format is used to view the image better. Six display formats are available, including V1/2, V1/3, V2/3, H1/2, H1/4 and O1/4.

To set the display format:

1. Select the **Menu** key in the real time scan. A menu pops up on the screen.
2. Select **DISPLAY FORMAT** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to make the setting.

6.4.3.6 Power

Power is used to select the amount of ultrasound acoustic power produced by the probe. The adjustment range of the power is 1-100%, and $\pm 1\%$ can be adjusted each time. The real time value of the power is displayed in the imaging information area of the basic screen.

To adjust the power:

1. Select **POWER %** by pressing the corresponding function key.
2. Rotate it to adjust the value.

NOTE:

Expose the patient to the lowest practical transmit power level for the shortest possible time to achieve a satisfactory diagnosis.

6.4.3.7 Video Invert

Video invert is used to invert the M trace display related to brightness.

To enable or disable the video invert:

1. Select **VIDEO INVERT** by pressing the corresponding function key.
2. Rotate it to enable or disable the feature.

6.5 Acquiring Spectral Doppler Images

Spectral Doppler imaging is intended to provide measurement data concerning the velocity, the direction, the category of the arterial or vein flows. It contributes a more accurate qualitative analysis than the color flow imaging.

Spectral Doppler includes Pulsed Wave Doppler (PW) mode and Continuous Wave Doppler (CW) mode.

6.5.1 PW Mode

Pulsed Wave Doppler (PW) is a Doppler mode that measures velocity in a PW sample volume and displays that information in a spectral trace with audio output. PW includes conventional PW and High Pulse Repetition Frequency (HPRF). PW Doppler can be combined with the B mode for rapidly selecting the anatomical site for PW Doppler examination. The site where PW Doppler data is derived appears graphically on the B-Mode image.

Perform the following steps to acquire PW-mode images

1. Optimize a B-mode image.
2. Select **PW** on the control panel to enter the inactivated B+PW mode.
The basic screen is divided into two displays as the following figure shows.

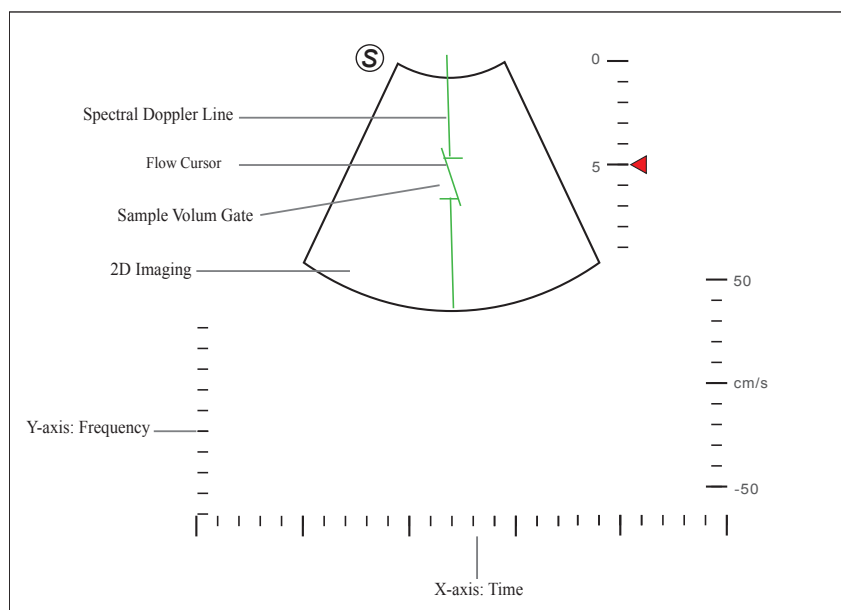


Figure 6-11 Inactivated B+PW Mode Imaging Screen

- The Spectral Doppler line and the sample volume gate are used to locate the qualitative analysis on the image.
 - The flow cursor needs to be adjusted parallel to the flow when measuring the velocity.
 - X-axis is the time scale.
 - Y-axis is Doppler frequency scale, including a positive and negative indicator.
3. Adjust the position and angle of the Spectral Doppler line.
 - Position the sample volume gate on the Spectral Doppler line by moving the trackball up or down.
 - Adjust the angle of the Spectral Doppler line by moving the trackball left or right.
 - Select the **Set** key to confirm.

4. Adjust the sample volume gate.

- Adjust the size of the sample volume gate by moving the trackball.
- Rotate the **Angle** knob to increase or decrease the angle of the flow cursor.

5. Select the **Update** key to activate the PW mode.

The basic screen displays as below after being activated.

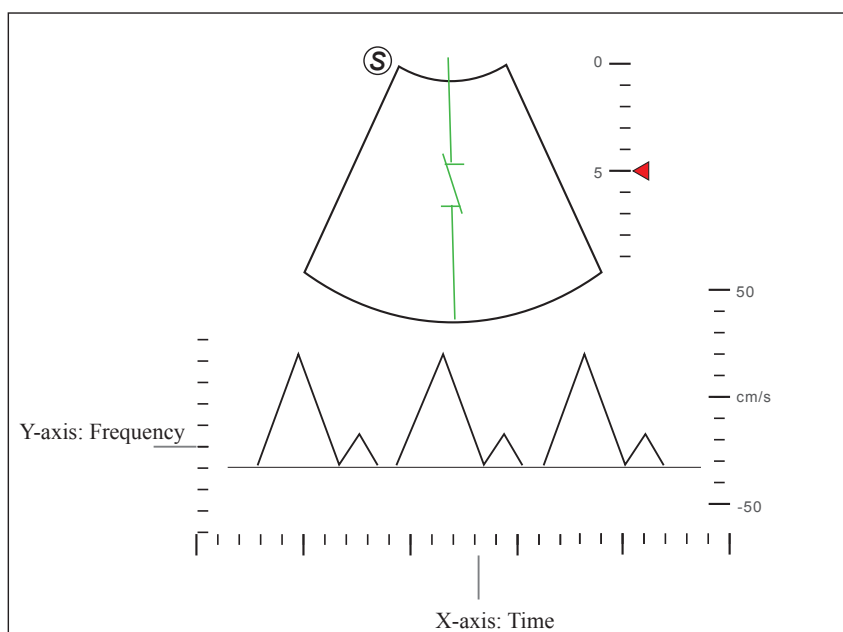


Figure 6-12 PW-Mode Imaging Screen

Select the **AUDIO +** or **AUDIO -** key to adjust the audio volume.

NOTE:

Once the PW mode is activated, you can move the trackball to stop the Doppler trace and adjust the sample volume gate. You can also continue tracing without moving the trackball more than 0.5 second.

6. Optimize the PW-mode image. For details, refer to Section 6.4.3 Optimizing M-Mode Images.
7. Select **PW** to exit.

6.5.2 CW Mode

Continuous Wave Doppler (CW) uses continuously transmitted and received ultrasound energy to generate a spectral display. CW Doppler is used to measure a high velocity, the highest velocity at a specific site, but no aliasing is created.

Perform the following steps to acquire CW-mode images.

1. Optimize a B-mode image.
2. Select **CW** on the control panel to enter the inactivated B+CW mode.

The basic screen is divided into two displays as the following figure shows.

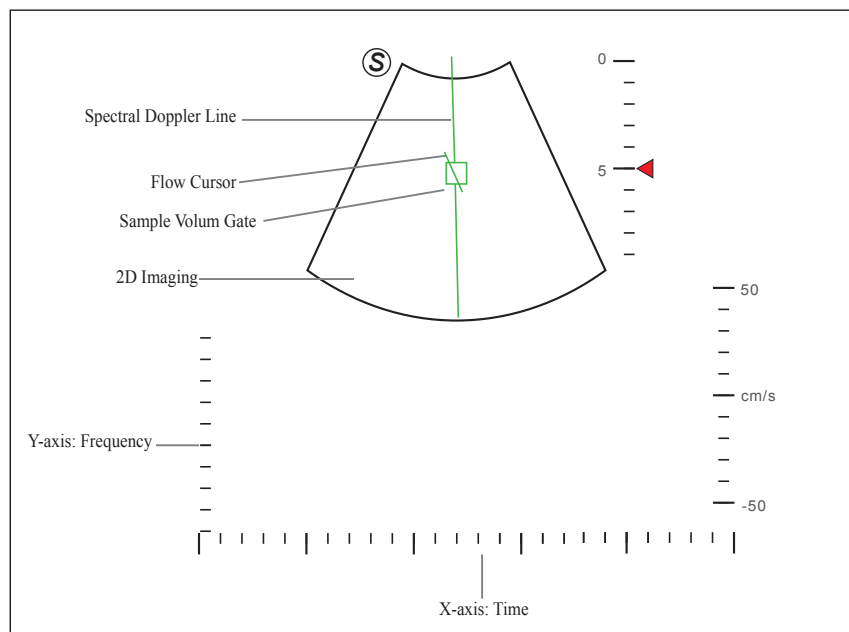


Figure 6-13 Inactivated B+CW-Mode Imaging Screen

- The Spectral Doppler line and the sample volume gate are used to locate the qualitative analysis on the image.
 - The flow cursor needs to be adjusted parallel to the flow when measuring the velocity.
 - X-axis is the time scale.
 - Y-axis is Doppler frequency scale, including a positive and negative indicator.
3. Adjust the position and angle of the Spectral Doppler line.
 - Position the sample volume gate on the Spectral Doppler line by moving the trackball up or down.
 - Adjust the angle of the Spectral Doppler line by moving the trackball left or right.
 - Select the **Set** key to confirm.
 4. Adjust the sample volume gate.
 - Adjust the size of the sample volume gate by moving the trackball.
 - Rotate the **Angle** knob to increase or decrease the angle of the flow cursor.
 5. Select the **Update** key to activate the CW mode.

The basic screen displays as below after being activated.

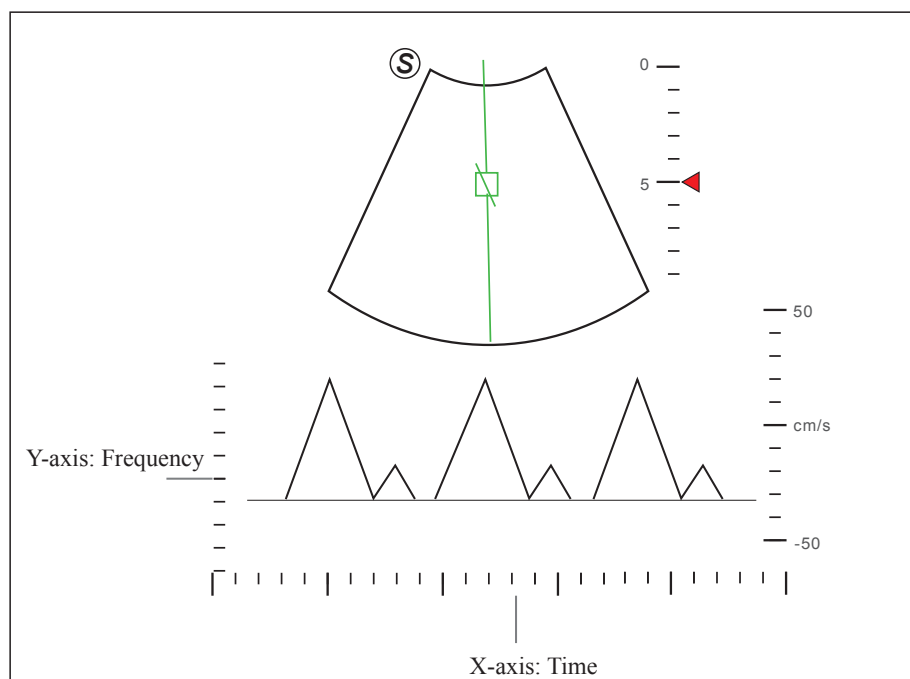


Figure 6-14 CW-Mode Imaging Screen

Select the **AUDIO +** or **AUDIO -** key to adjust the audio volume.

NOTE:

Once the PW-mode is activated, you can move the trackball to stop the Doppler trace and adjust the sample volume gate. You can also continue tracing without moving the trackball more than 0.5 second.

6. Optimize the CW-mode image. For details, refer to Section 6.5.3 Optimizing Spectral Doppler Images.
7. Select **CW** again to exit.

6.5.3 Optimizing Spectral Doppler Images

After activating the PW/CW mode, the imaging parameters display at the bottom of the LCD monitor as shown in Figure 6-12 and Figure 6-14, you can use them to optimize B-mode images.

You can adjust the **Display Format**, **Baseline** and **Angle Correct** on the pop-up menu by selecting the **Menu** key.

NOTE:

All parameters can be adjusted in a real time PW/CW mode, but **Chroma**, **Video Invert** and **Display Format** can also be adjusted in the frozen mode.

6.5.3.1 Gain

PW/CW gain is used to adjust the gain of spectrum map. Increasing the gain will brighten the image and you can see more received signals with less noise.

To adjust the gain:

- Rotate the **C** knob clockwise to increase the value.
- Rotate the **C** knob anticlockwise to decrease the value.

6.5.3.2 Pulse Repetition Frequency

Pulse repetition frequency is used to adjust the velocity scale, filter the unnecessary low frequency signal or the disturbance made by non-flow movements, such as breath, heart beat or sweeps of the probe.

The range of PRF value varies with the probe model and the exam type.

To adjust the pulse repetition frequency:

- Flip the **PRF** switch upwards to increase the value.
- Flip the **PRF** switch downwards to decrease the value.

NOTE:

The value of wall filter is also changed when adjusting PRF.

6.5.3.3 High Pulse Repetition Frequency

Once HPRF is enabled, besides the original sample volume gate, one or more sample volume gates appear at shallower positions on the 2D image.

Once HPRF is enabled, the unnecessary low frequency signal or the disturbance made by non-flow movements, such as breath, heart beat or sweeps of the probe will be filtered.

To enable the High Pulse Repetition Frequency:

Flip the **PRF** switch upwards to increase the value continuously, HPRF is automatically enabled when a certain value is reached.

NOTE:

The linear probes are not available for HPRF.

6.5.3.4 Baseline

Baseline represents the position of zero velocity or frequency. The velocity range in one direction can be increased or decreased by adjusting the baseline.

Baseline is used to unwraps the alias during color flow imaging, and display higher velocities without reversal of colors.

To adjust the baseline:

1. Select the **Menu** key in the real time PW/CW mode. A menu pops up on the screen.
2. Select **BASELINE** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to move the baseline towards positive or negative direction.
4. The speed scale on the y-axis at the bottom right of the screen varies with the baseline.
You can also flip the **BASELINE** switch to change the position of the baseline.

6.5.3.5 Wall Filter

Wall filter is used to filter the low frequency noise from tissues, such as vascular wall.

To adjust the wall filter:

1. Select **WF** by pressing the corresponding function key.
2. Rotate it to adjust the value.

6.5.3.6 Frequency

The probe is capable of generating a broadband signal with a certain frequency and bandwidth. At deeper position of Doppler imaging, the frequency optimizes the edges.

To adjust the frequency:

1. Select **FREQUENCY** by pressing the corresponding function key.
2. Rotate it to adjust the value.

6.5.3.7 Sweep Speed

Sweep speed is used to set the sweep speed of the Doppler trace. The refresh speeds of the time scale and the frequency scale vary with the sweep speed.

To adjust the sweep speed:

1. Select **SWEEP SPEED** by pressing the corresponding function key.
2. Rotate it to adjust the value.

6.5.3.8 Power

Power is used to select the amount of ultrasound acoustic power produced by the probe. The adjustment range of the power is 1-100%, and $\pm 10\%$ can be adjusted each time. The real time value of the power is displayed in the image parameter area of the basic screen.

To adjust the power:

1. Select **POWER %** pressing the corresponding function key.
2. Rotate it to adjust the value.

NOTE:

Expose the patient to the lowest practical transmit power level for the shortest possible time to achieve a satisfactory diagnosis.

6.5.3.9 Chroma

Chroma is used to colorize the gray scale image to enhance the discrimination capability. There are 13 colors available.

To adjust the chroma:

1. Select **CHROMA** by pressing the corresponding function key.
2. Rotate it to make the setting.

6.5.3.10 Dynamic Range

Dynamic Range increases the adjustable range of contrast by enhancing the intensities of parts of the grayscale. It is useful for optimizing the ultrasound image texture.

To adjust the dynamic range:

1. Select **DYN** by pressing the corresponding function key.
2. Rotate it to adjust the value.

6.5.3.11 Display Format

Display format is used to view the image better. Six display formats are available, including V1/2, V1/3, V2/3, H1/2, H1/4 and O1/4.

To set the display format:

1. Select the **Menu** key in the real time PW/CW mode. A menu pops up on the screen.
2. Select **DISPLAY FORMAT** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to make the setting.

6.5.3.12 Flow Invert

Flow invert is used to view the flow velocity from a different perspective.

To enable or disable the flow invert:

- Select the **Invert** key to enable the feature, and **Invert** appears on the top right corner of the image.
- Select the **Invert** key to disable the feature, and **Invert** disappears on the top right corner of the image.

6.5.3.13 Video Invert

Video invert is used to view the background of the spectral display from a different perspective.

To enable or disable the flow invert:

1. Select **VIDEO INVERT** by pressing the corresponding function key.
2. Rotate it to enable or disable this feature.

6.5.3.14 Angle Correction

Angle correction is used to adjust the angle of the flow cursor in the PW mode.

To set the angle correction:

1. Select the **Menu** key in the real time PW mode. A menu pops up on the screen.
2. Select **ANGLE CORRECT** by using the trackball or ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key to enable or disable this feature.

NOTE:

You need to set it only when performing the measurement related to the velocity.

6.5.3.15 2D Refresh

2D refresh is used to synchronously display two real time scans in the 2D and the PW modes.

To enable or disable 2D refresh:

1. Select **2D REFRESH** by pressing the corresponding function key in the inactivated PW mode.
2. Rotate it to enable or disable this feature.
 - If the feature is enabled, select the **Update** key to activate the PW mode and two real time scans in the 2D and the PW modes are displayed.
 - If the feature is disabled, a frozen 2D-mode image and PW real time scan are displayed.

NOTE:

2D refresh is only available in the PW mode.

6.6 Acquiring Triplex-Mode Images

The triple mode is overlapped by three different imaging modes, and can be applied to view the image. The triple mode includes B+Color/TDI +M, B+Color/DPI/TDI +PW and B+Color/DPI+CW.

6.6.1 B+Color/TDI +M

NOTE:

Only the phased probe is available for B+Color/TDI +M.

Perform the following steps to acquire the image.

1. Optimize a Color/TDI mode image.
2. Select **M** on the control panel to enter the inactivated Color+M/TDI +M mode.

The basic screen is divided into two displays as the following figure shows.

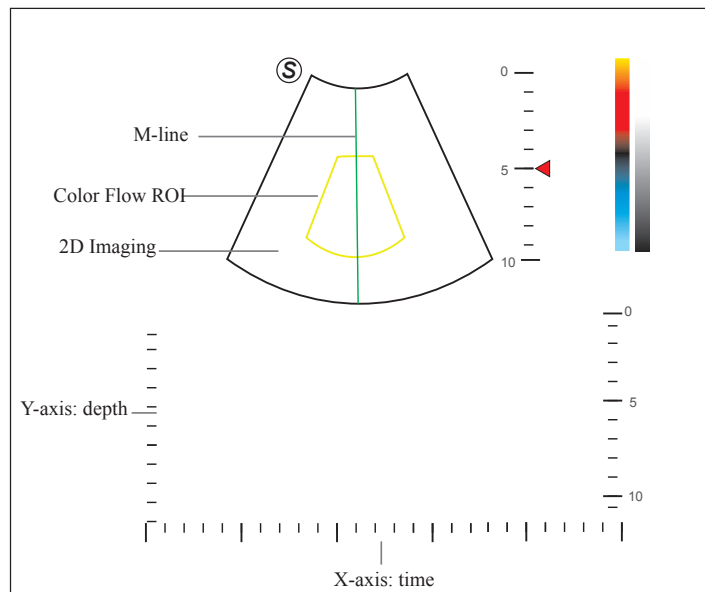


Figure 6-15 Inactivated B+Color/TDI +M-Mode Imaging Screen

The ROI and M-mode cursor is used to position the M-line.

- X-axis is the time scale.
- Y-axis is the depth scale.

3. Adjust the ROI and M-mode cursor by using the trackball.
4. Select the **Update** key to activate the Color+M/TDI+M mode.

The basic screen displays as below after being activated.

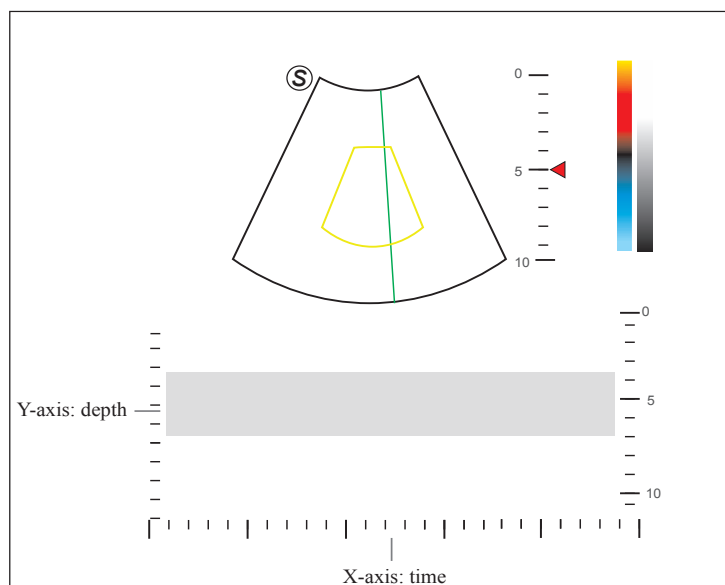


Figure 6-16 B+Color/TDI +M-Mode Imaging Screen

5. Optimize M-mode image. For details, refer to Section 6.4.3 Optimizing M-Mode Images.
6. Select **M** to exit.

6.6.2 B + Color/DPI/TDI + PW

Perform the following steps to acquire the image.

1. Optimize a Color/DPI/TDI-mode image.
2. Select **PW** to enter the inactivated Color/DPI/TDI+PW mode.

The basic screen is divided into two displays as the following figure shows.

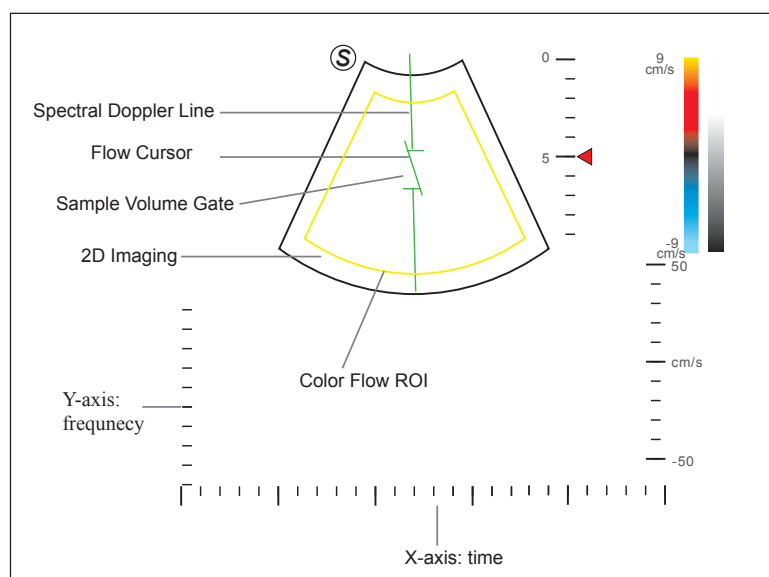


Figure 6-17 Inactivated B+Color/DPI/TDI+PW-Mode Imaging Screen

3. Adjust the position and angle of the Spectral Doppler line.
 - Position the sample volume gate on the Spectral Doppler line by moving the trackball up or down.
 - Adjust the angle of the Spectral Doppler line by moving the trackball left or right.
 - Select the **Set** key to confirm.
4. Adjust the sample volume gate.
 - Adjust the size of the sample volume gate by using the trackball.
 - Rotate the **Angle** knob to increase or decrease the angle of the flow cursor.
5. Select the **Update** key to activate the PW mode.

The basic screen displays as below after being activated.

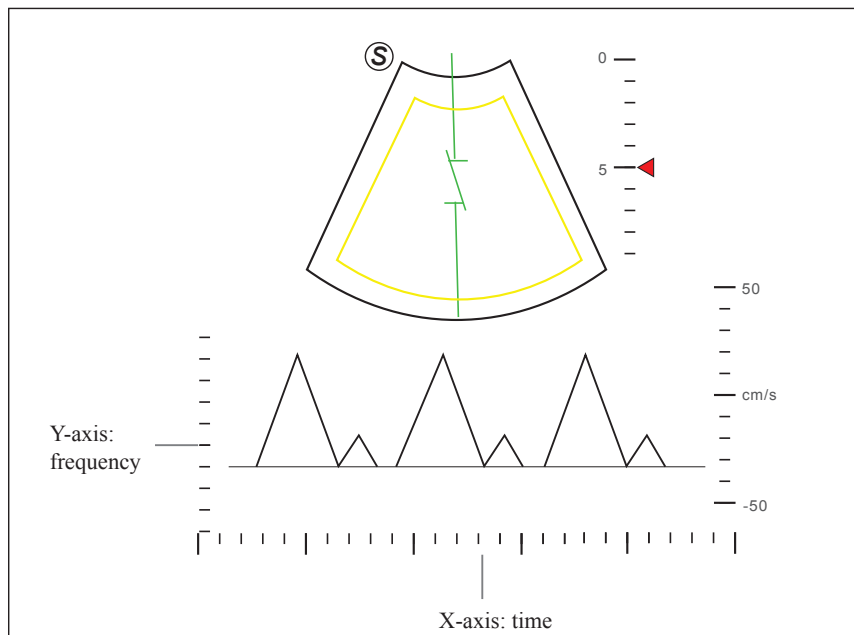


Figure 6-18 B+Color/DPI/TDI+PW-Mode Imaging Screen

Select the **AUDIO +** or **AUDIO -** key to adjust the audio volume.

6. Optimize the PW-mode image. For details, refer to Section 6.5.3 Optimizing Spectral Doppler Images.
7. Select **PW** to exit.

6.6.3 B+Color/DPI+CW

For details, refer to Section 6.6.2 B + Color/DPI/TDI + PW.

Chapter 7 Using 3D

3D imaging allows you to see width, height and depth of the anatomical structure. 3D imaging can be performed by all probes, but the quality of images is closely related to 2D imaging.

3D imaging mainly applies to obstetric exams, and can be used to see the three dimensional volume image of internal organs or fetus.

7.1 Acquiring 3D Images

The following description uses 3D imaging performed with the VC6-2 probe as an example.

Perform the following steps to acquire 3D images.

1. Enter the patient information, select VC6-2 probe and an exam type (such as obstetric exam throughout this chapter) to enter the B mode.
2. Optimize imaging parameters in the B mode.
3. Apply adequate gel on the patient.
4. Acquire a B-mode image of high quality.
5. Select **3D/4D** on the control panel to enter the inactivated 3D mode.

NOTE:

You should select the **Freeze** key and select **3D** to enter the inactivated 3D mode when performing with non-volume probes.

The 2D imaging with ROI and sample line is displayed in the inactivated 3D mode, only the data in ROI is acquired for 3D imaging.

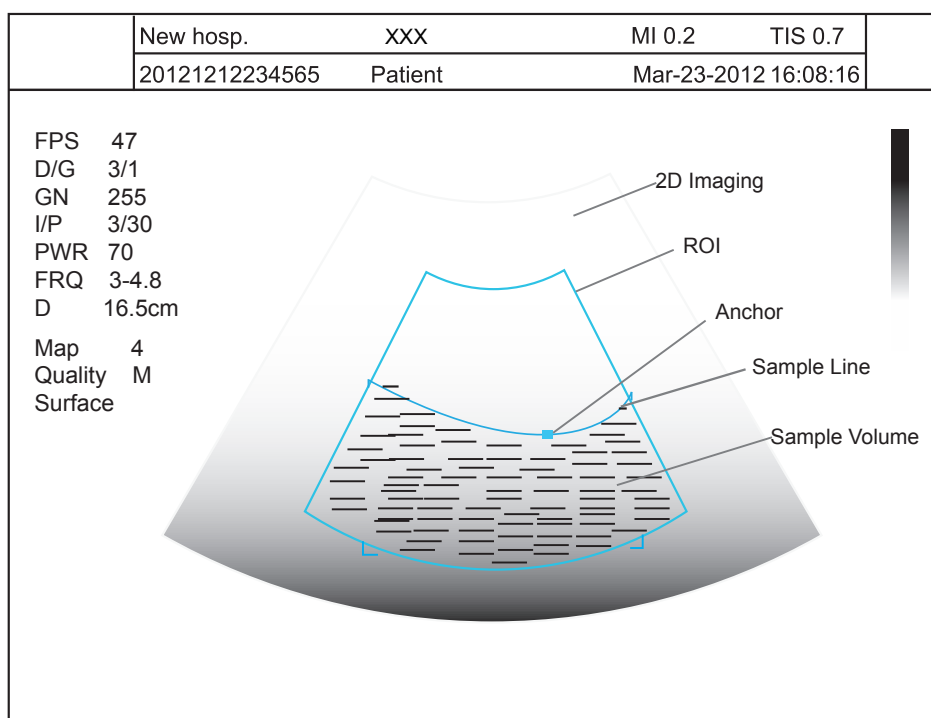


Figure 7-1 Inactivated 3D Imaging Screen

6. Adjust ROI.
 - Move the trackball to position ROI.
 - Select the **Set** or **Update** key on the control panel, adjust the sample line by positioning the anchor with the trackball.
 - Select the **Set** or **Update** key again to adjust ROI.

- If necessary, select the **Set** or **Update** key to reposition ROI.
- 7. Select **3D**, set render mode, image quality and sweep angle.
For details, refer to Section 7.2 Working with 3D Images.
- 8. Select the **Freeze** key to display the 3D imaging.
The imaging area of the screen is divided into 3 reference images and a 3D image by default.

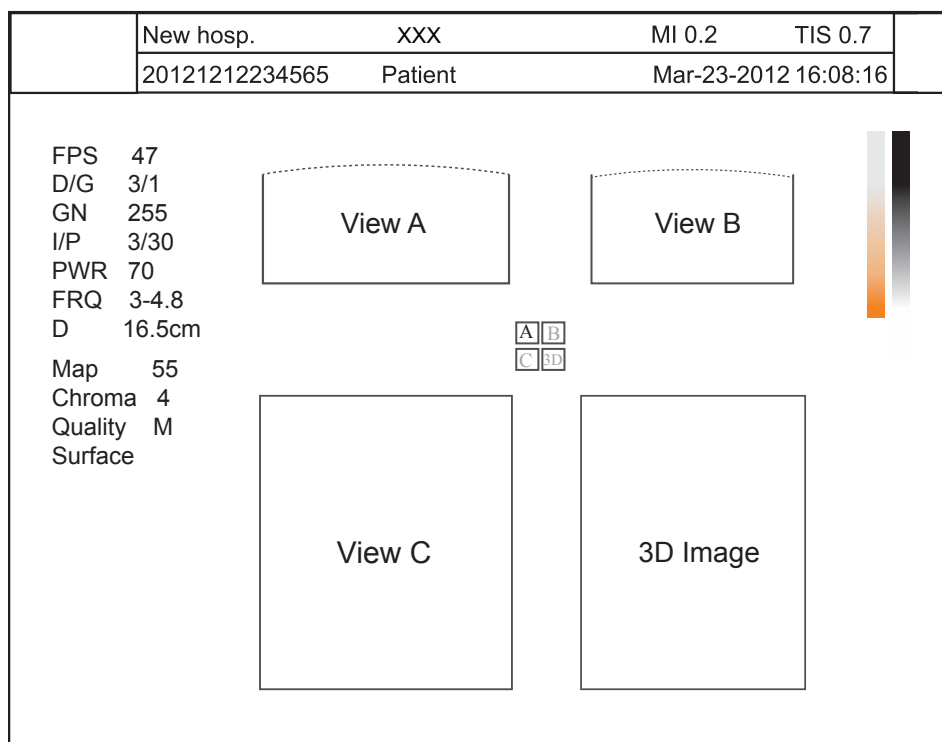


Figure 7-2 3D Imaging Screen

In the above figure,

- A view on the top left shows the image on the X-axis.
 - B view on the top right shows the image on the Y-axis.
 - C view on the bottom left shows the image on the Z-axis.
 - The image on the bottom right shows the 3D image.
- Select the **Freeze** key again to display the 4D imaging.
 - Select **Full Disp.2D** by pressing the corresponding function key to return to the 3D inactivated mode.
 - Select **3D/4D** on the control panel to exit the 3D imaging mode and return to a real time B-mode.

7.2 Working with 3D Images

You can review, optimize or save 3D images.

7.2.1 Setting Display Format

The 3D imaging area is divided into four parts by default.

- Select **DUAL DISPLAY** by pressing the corresponding function key to activate the dual display format.
- Select **FULL DISP.3D** by pressing the corresponding function key to activate the 3D full display format.
- Select **Quad Display** by pressing the corresponding function key to activate the quad display format.
You can also select 1, 2 or 4 key on the control panel to activate Full Disp.3D, Dual Display or Quad Display.

7.2.2 Reviewing Cine

Perform the following steps to review the cine.

1. Select the **Menu** key. A menu pops up on the screen
2. Select **CINE REVIEW** by using ↑ or ↓ key.
3. Rotate the **Menu** key or select <- or -> key again to review the cine.

NOTE:

Only volume probes are available for this feature.

7.2.3 Setting Render Mode

Vol, MaxIP and X-ray can be set.

- **Vol** is used to display the contour of fetus.
- **MaxIP** is used to display the spinal column and skeleton of the fetus.
- **X-ray** is used to display the tissues of different structure and tumor tissues.

Perform the following steps to set the render mode.

1. Select the **Menu** key and a menu pops up on the screen.
2. Select **RENDER MODE** by using ↑ or ↓ key.
3. Rotate the Menu key or select <- or -> key to make the setting.

NOTE:

The imaging render mode can be also set in the inactivated 3D mode.

7.2.4 Cropping Reviews by ROI

You can crop 3D image by adjusting ROI on reference images to remove areas outside from interest area. This feature is suitable for cropping regular reviews.

Perform the following steps to crop a review.

1. Select the **T-ball** key to activate the cursor.
2. Move the cursor on the image of A View, B View or C View by using the trackball, and select the **Set** key or **Update** key to choose the desired reference image.
3. Crop the image of A View, B View or C View, as shown in Figure 7-3.

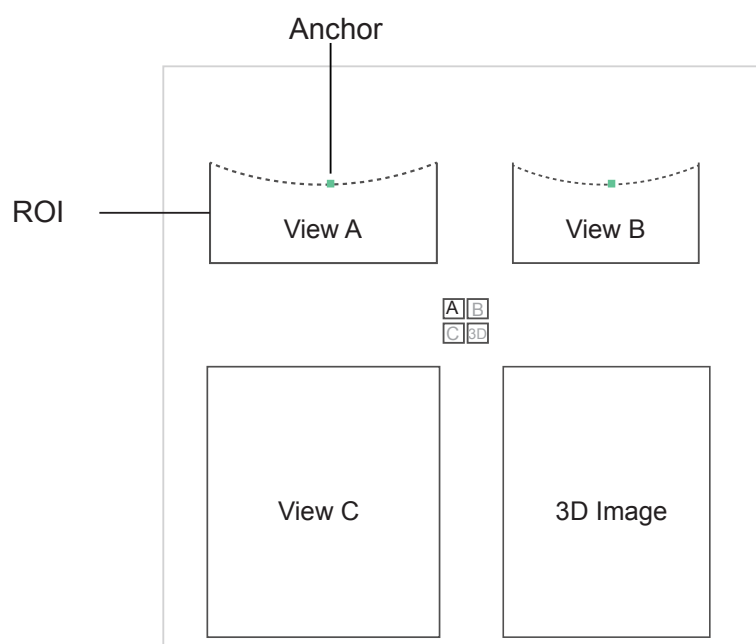


Figure 7-3 Cropping Review Screen

- If the anchor is activated, you can crop images inside ROI by performing the following steps.
 - Select the **Set** key to activate ROI, adjust the size of ROI by using the trackball, and then select the **Set** or **Update** key to confirm.
 - Select the **Update** key to activate the anchor, position the anchor by using the trackball, and then select the **Set** or **Update** key to confirm.
- If the anchor is not activated, you can crop images inside ROI by using the trackball. Only images inside ROI are generated to a 3D image, and the real-time 3D image is also displayed when cropping reviews.

If necessary, repeat the Step 1-3 above to crop the image again.

NOTE:

Selecting **Hide ROI** can disable the ROI.

7.2.5 Cropping Reviews by the Trace

You can crop the image by tracing its border to remove areas outside from interest area. This feature is suitable for cropping irregular reviews.

Perform the following steps to crop a review.

1. Select the **Menu** key and a menu pops up on the screen.
2. Select **Trace Cut** by using \uparrow or \downarrow key.
3. Rotate the **Menu** key or select \leftarrow or \rightarrow key to make the setting.
 - Set it to **Off** to disable the feature.
 - Set it to **In** to enable the feature and remove all data outside from the image.
 - Set it to **Out** to enable the feature and remove all data inside from the image.
4. Select the **T-ball** key and a cursor appears on the screen.
5. Move the cursor on the image by using the trackball, select the **Set** key, and then trace the border of the object.
6. Select the **Set** key to acquire the desired image.
In the following figure, Trace cut is set to **In**.

NOTE:

Selecting **UNDO CUT** can restore the cutting by using Trace Cut.

7.2.6 Moving/Rotating/Magnifying Images

- To select an image
 1. Select the **T-ball** key and a cursor appears on the screen.
 2. Move the cursor on an image and select the **Set** key or **Update** key to select the desired reference image.

- To move images
 1. Select MOVE L-R or MOVE U-D by pressing the corresponding function key.
 2. Rotate this function key to move the images.

You can also use \uparrow , \downarrow , \leftarrow or \rightarrow to move three sectional planes and the image.

- To rotate images
Rotate the images in the following four ways.
 - Select **ROTATE X**, **ROTATE Y** or **ROTATE Z** by pressing the corresponding function key and turn it to rotate the image along x, y or z axis.
 - Move the cursor on one image and select the **Set** key or **Update** key, and rotate the 3D image by using the trackball.
 - Select the menu item of **ORIENTATION** and rotate the **Menu** key or select \leftarrow or \rightarrow key to rotate the images 90°, 180° or 270°.
 - Select the menu item of **AUTO ROTATE** and rotate the **Menu** key or select \leftarrow or \rightarrow key to make the setting. All images are automatically rotated from the original position to the position of 1/2 preset angle, and then rotated in a reversed way in turns.

■ To zoom in/out all images

Magnify the images in the following ways.

- Select the **Zoom** key and rotate the **Angle** key to zoom in or zoom out the images.
- Select **ZOOM** by pressing the corresponding function key and rotate it to zoom in or zoom out the images. Meanwhile, a size multiplier is displayed in the information area of the basic screen.

7.2.7 Optimizing 3D Image

■ To choose the color

- Select the menu item of **COLOR MAP** and rotate the **Menu** key or select <- or -> key to choose the color of the 3D image.
- Select the menu item of **B CHROMA** and rotate the **Menu** key or select <- or -> key to choose the color of the image on the A, B or C View.

The color map or gray scale on the top right of the imaging area varies with this setting.

■ To set the smoothness and brightness

- Select the menu item of **SMOOTH** and rotate the **Menu** key or select <- or -> key to adjust the smooth of the image.
- Select the menu item of **LIGHTNESS** and rotate the **Menu** key or select <- or -> key to adjust the brightness of the image.

■ To set the threshold

You can set the threshold to adjust the transparency of the image.

Select the menu item of **THRESHOLD** and rotate the **Menu** key or select <- or -> key to adjust the value.

■ To adjust the image stability and quality

- Select the menu item of **STABILITY** and rotate the **Menu** key or select <- or -> key to enable or disable the feature. This setting is only effective in the real time scan.
- Select the menu item of **IMAGE QUALITY** and rotate the **Menu** key or select <- or -> key to make the setting. A higher quality image can be obtained by running a motor of the probe at a slower speed. This setting is only effective in the real time scan.

NOTE:

Stability and **Image Quality** can also be set without delay in the inactivated 3D mode.

7.2.8 Observing Reviews by the Plane

You can observe reviews by using the plane.

Perform the following steps to observe a review.

1. Select the menu item of **CLIP PLANE** to enable this feature.
2. Select the **T-Ball** key on the control panel to activate the cursor.
3. Move the cursor on the image by using the trackball, select the **Update** key to select this image.
4. Observe the review by using the trackball.

7.2.9 Observing Reviews by the Slice

You can observe reviews by using two or more slices. For example, each layer of an irregular tumor can be observed by applying this feature.

Perform the following steps to observe a review.

1. Select the menu item of **MULTI-SLICE** and rotate the **Menu** key or select <- or-> key to chose one slice.

After selection, the slice on the corresponding axis is displayed on the screen.

2. Select the menu item of **SLICE NUMBER** and rotate the **Menu** key or select <- or-> key to set the slice number to 9, 16 or 25.

In the following figure, the slice on X axis (Ref A, number: 9) is taken as an example.

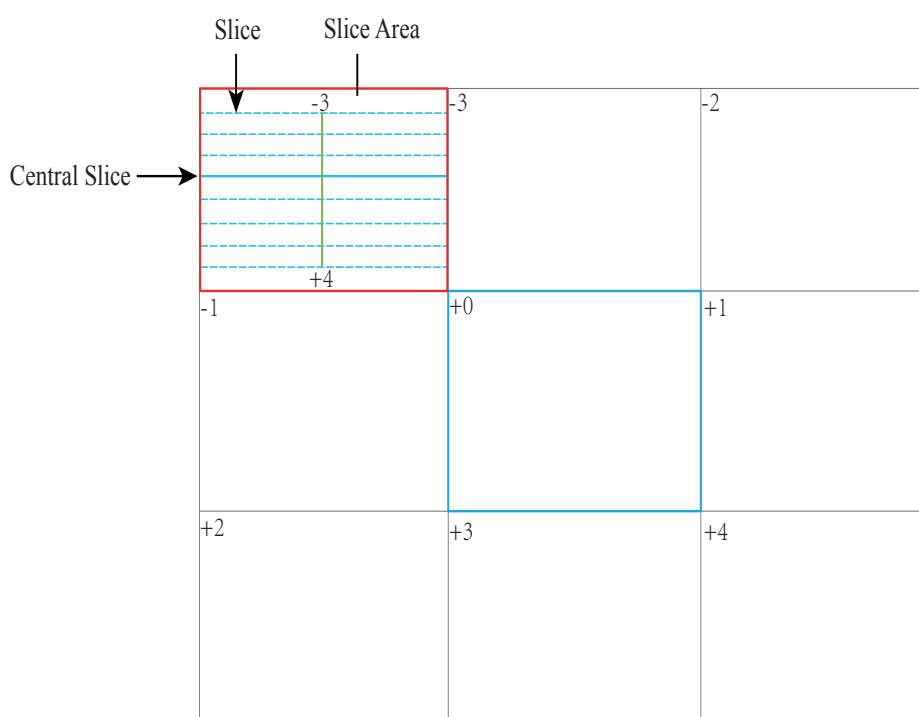


Figure 7-4 Multi-Slice Imaging Screen

Eight slice lines and the corresponding number are displayed on the main slice imaging.

Except the main slice, the other eight slices are indicated by the number on top left and are displayed on the screen.

Move the cursor on the slice by using the trackball, select the **Set** key on the control sectional plane to select it. If the slice is selected, its corresponding line on the main slice imaging turns to a full line.

■ To adjust the slice span

Select the menu item of **SLICE SPACING** and rotate the **Menu** key or select <- or-> key to adjust the span among the slices. The span and content vary with this setting.

7.2.10 Setting the Sweep Angle

Select the menu item of **SWEEP ANGLE** and rotate the **Menu** key or select <- or -> key to adjust the sweep angle. This setting is only effective in the real time scan.

NOTE:

This setting can also be set without delay in the inactivated 3D mode.

7.2.11 Setting the Scan Method

Set **Scan Method** in accordance with your actual use.

Select the menu item of **SCAN METHOD** and rotate the **Menu** key or select <- or -> key to set the sweep mode to **Lin** or **Sec**.

NOTE:

This setting is only effective when entering the 3D imaging from a frozen B imaging.

7.2.12 Adjusting Z Angle/Z Scale

The image may be distorted if you perform the scan too quickly by using the probe. To acquire a vivid image, you can adjust the value of **Z Angle/Z Scale** before the scan.

- If **Scan Method** is set to **Sec**, you can adjust the sweep angle when performing the scan by the probe. Select the menu item of **Z ANGLE** and rotate the **Menu** key or select <- or -> key to adjust the angle.
- If **Scan Method** is set to **Lin**, you can adjust the sweep span when performing the scan by the probe. Select the menu item of **Z SCALE** and rotate the **Menu** key or select <- or -> key to adjust the scale.

NOTE:

This setting is only effective when entering the 3D imaging from a frozen B imaging.

7.2.13 Restoring the Image

Select the menu item of **RESET** and rotate the **Menu** key or select <- or -> key to restore the image to the original position.

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Chapter 8 Using 4D

4D imaging enables the display of the real time 3D anatomical structure.

4D imaging only can be performed by the compatible volume probes. 4D imaging adds the dimension of “movement” to a 3D image by providing continuous, real-time displays of internal organs or fetus. 3D imaging provides single frame images, while 4D imaging provides continuous, high volume acquisition of 3D images.

The following description uses the fetal imaging as an example, the other parts imaging are as the same.

8.1 Acquiring 4D Images

The following description uses 4D imaging performed by the VC6-2 probe as an example.

8.1.1 Entering the Real-Time 4D Imaging

Perform the following steps as follows.

1. Enter the patient information, select VC6-2 probe and an exam type (such as obstetric exam throughout this chapter) to enter the B mode.
2. Optimize imaging parameters in the B mode.
3. Apply adequate gel on the patient.
4. Acquire a B-mode image of high quality.
5. Select **3D/4D** on the control panel to enter the inactivated 4D mode.

The 2D imaging with ROI and sample line is displayed in the inactivated 4D mode, only the data in ROI is acquired for 4D imaging.

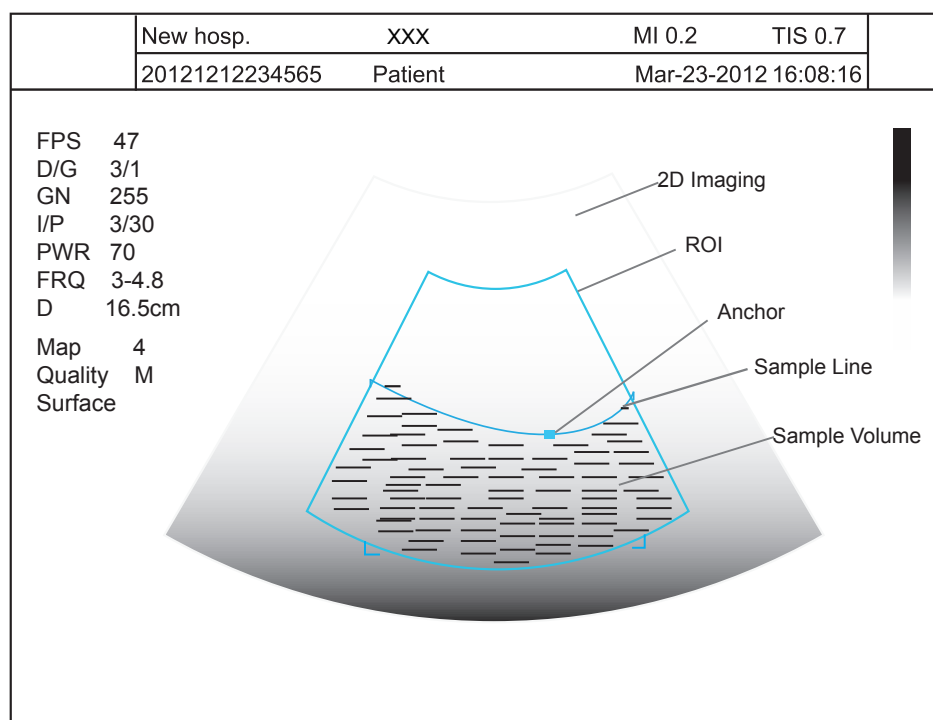


Figure 8-1 Inactivated 4D Imaging Screen

6. Adjust ROI.
 - Move the trackball to position ROI.
 - Select the **Set** or **Update** key on the control panel, adjust the sample line by positioning the anchor with the trackball.
 - Select the **Set** or **Update** key again to adjust ROI.
 - If necessary, select the **Set** or **Update** key to reposition ROI.

7. Set the stability, render mode, image quality and sweep angle.
For details, refer to Section 7.2 Working with 3D Images.
8. Display the 4D imaging in the following ways.
 - Select **DUAL DISPLAY**, **FULL DISP.3D** or **QUAD DISPLAY** by pressing the corresponding function key to activate the corresponding display format.
 - Select **1**, **2** or **4** on the key panel to display the 4D imaging in a full, dual or quad display.
You can also select the **Freeze** key in the 3D imaging mode to enter the 4D imaging mode.
The imaging area of the screen is divided into 3 reference images and a dynamic 3D image by default.

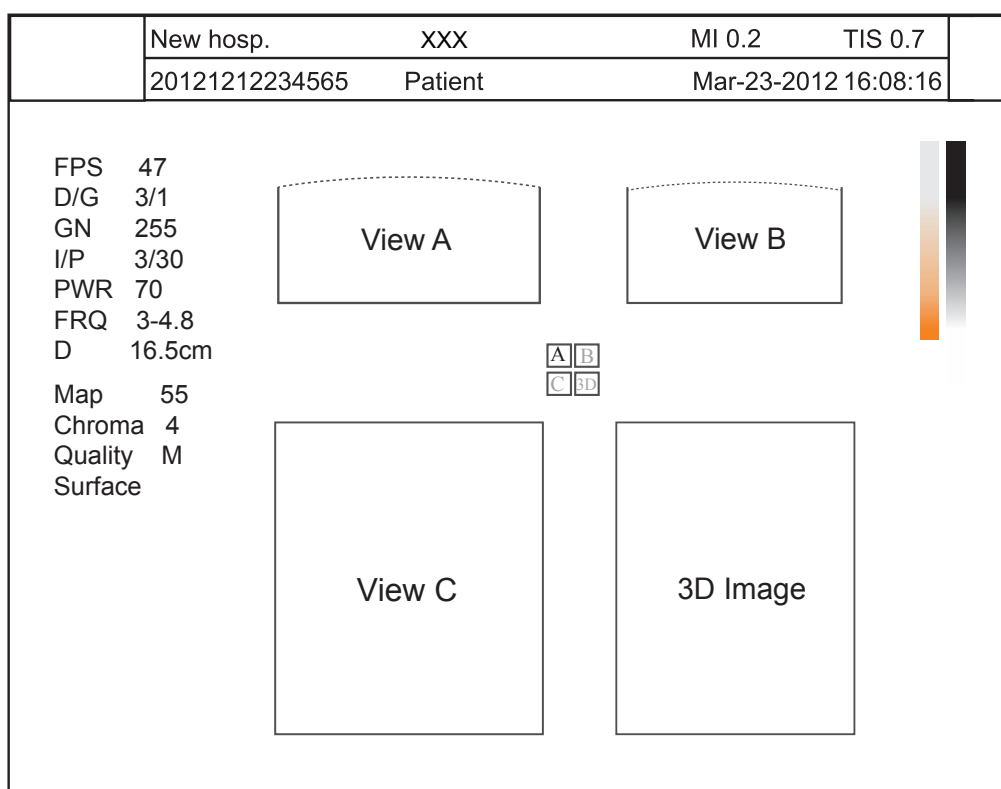


Figure 8-2 4D Imaging Screen

In the above figure,

- A view on the top left shows the image on the X-axis.
 - B view on the top right shows the image on the Y-axis.
 - C view on the bottom left shows the image on the Z-axis.
 - The image on the bottom right shows the dynamic 3D image.
- Select **Full Disp.2D** by pressing the corresponding function key to return to the 4D inactivated mode.
 - Select **3D/4D** on the control panel to exit the 4D imaging mode and return to a real time B mode.

8.1.2 Acquiring Dynamic 3D Image

You can acquire the dynamic 3D image of high quality by applying the features described in Section 7.2 Optimizing 3D Image.

Select the **Freeze** key on the control panel to enter the cine review mode after acquiring the image.

8.2 Working with 4D Images

You can review, optimize or save 4D images in the frozen mode. For details, refer to Section 7.2 Optimizing 3D Image.

Chapter 9 Working with Images

You can work with the acquired images by using the features provided by the ultrasound system, such as the splitting display, panoramic display and annotations.

9.1 Imaging Features

9.1.1 Imaging Reverse

■ To reverse left or right

Select **L/R** on the control panel to reverse the real time scan left or right.

Or, select the **Menu** key and select **LT-RT** on the pop-up menu. Rotate the **Menu** key or select <- or -> key to reverse the real time scan left or right.

■ To reverse up or down

Select **Up/Down** on the control panel to reverse the real time scan up or down.

9.1.2 Splitting Display

You can position two or four images side by side on the screen to compare the images by using the splitting display.

■ Dual-splitting Display

1. Select **B**, **Color**, **DPI** or **TDI** on the control panel to enter the real time scan.

2. Select the **Dual** key on the control panel to enter the dual-splitting display.

The image is splitted by two parts with a frozen image on the left and a real time scan on the right.

The real time B-mode is taken as an example in the following figure.

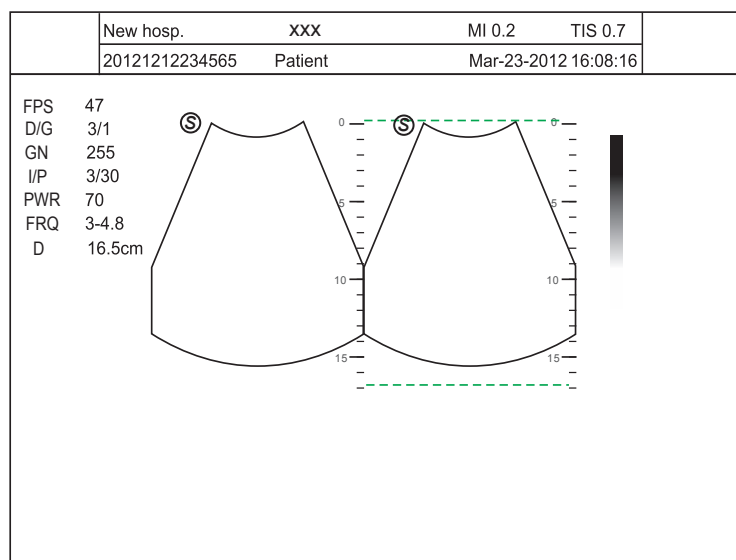


Figure 9-1 Real Time + Frozen B

- Select the **C**, **DPI**, **PW**, **M** or **THI** key on the control panel to enter the corresponding mode for the real time scan.
- Select **Dual** to freeze the real time scan and unfreeze the other image.
- Select the **B** key to exit the dual display.

- Select the **Menu** key and then select **Dual B** to display two real time scans if one of the two images is a color-mode (Color, DPI or TDI) image. Two real time scans in different imaging mode display on the screen, as shown in Figure 9-2.

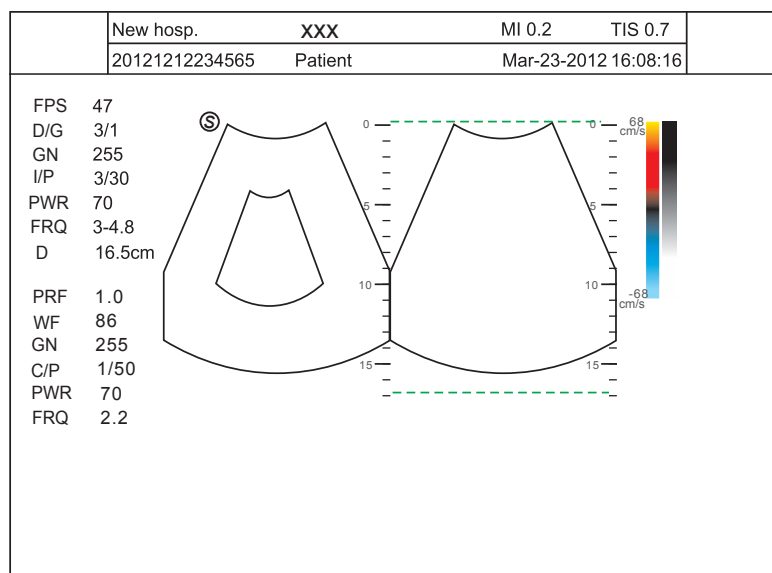



Figure 9-2 Real Time Color + Real Time B

■ Quad-splitting Display

1. Select **B**, **Color**, **DPI** or **TDI** on the control panel to enter the real time scan.
2. Select  on the control panel to enter the quad-splitting display. The image is split into four parts with a frozen image on the top left and three real time scans on the other parts.

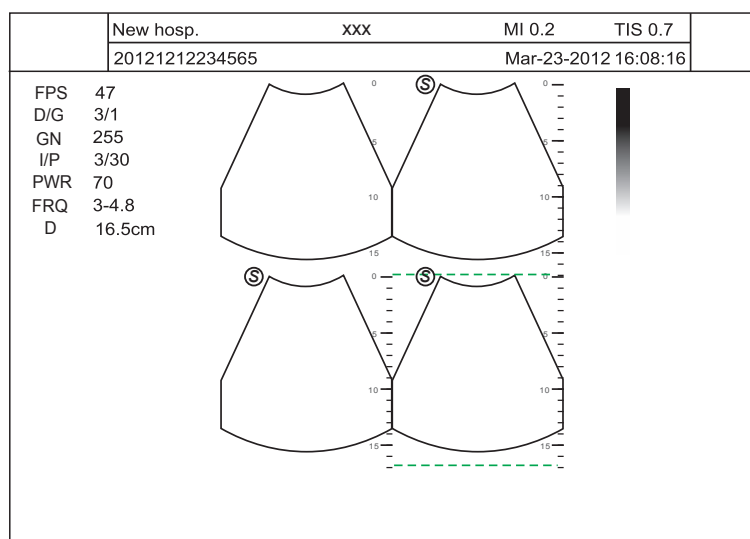



Figure 9-3 Quad-splitting Display

- Select  on the control panel to freeze the real time scan and unfreeze the other images.
- Select the **B**, **C** or **DPI** key on the control panel to enter the corresponding mode for the real time scan.

3. Select the **B** key to exit the quad-splitting display.

9.1.3 M-Tuning

M-Tuning optimizes the image quality.

To enable or disable M-Tuning,

Select **m-Tuning** to enable or disable this feature.

9.1.4 Tissue Harmonic Imaging

Tissue Harmonic Imaging (THI) uses the harmonic frequencies generated by tissue. The fundamental transmit frequency results in a harmonic frequency echo. The harmonic frequency received from the tissue is a multiple of the fundamental transmit frequency. The fundamental and any accompanying artifacts are missing from the harmonic frequency that the system receives. The artifact reduction, and the concomitant reduction in haze and clutter, increases contrast resolution and improves border delineation. THI is useful in difficult-to-image patients.

In real time B/Color/PW/CW mode, select **THI** on the control panel to enable the THI mode, and **H** appears at the lower left corner of the screen. Optimize the image just as the way you did in the B mode.

Select **THI** again to exit the imaging, and **H** disappears from the screen.

NOTE:

- The system automatically optimizes certain parameters (B-mode gain, frequency and acoustic output power) upon enabling THI.
- Compared to the B-mode imaging, THI improves image resolution but decreases the depth. Therefore, you should make an optimal balance when choosing an imaging mode.
- THI is available only performed by the compatible probes.

9.1.5 Panoramic Imaging

Panoramic imaging broadens the scope of spatial relationships, thereby sequentially aligning individual images in their anatomical context. Panoramic Imaging has the ability to display an entire abnormality and show its relationship to adjacent structures on a single, static image.

NOTE:

Panoramic imaging is only available performed by the linear and convex probes.

- Concerns for applying Panoramic imaging
 - To maintain the good image quality, you should set the **Compound Imaging** feature to **Off** before performing the panoramic imaging.
 - Apply adequate amount of coupling gel along the intended path of the scan.

- Do not shake, rotate or tilt the probe during the scan.
 - Ensure the probe remains contact with the patient skin and be perpendicular to the skin surface when scanning.
 - Do not change the scan direction or move the probe backward.
 - Some variation of the scan speed is allowed but do not change the speed suddenly. When the scan depth increases, generally it is required to decrease the scan speed.
- Perform the following steps to apply the real time Panoramic imaging mode.
1. Optimize the B-mode image.
 2. Select **Pan** on the control panel, and optimize the image again.
Select **QUIT** by pressing the corresponding function key to exit the real time panoramic imaging mode.
 3. Perform the scan and the screen displays the aligned individual images.
 4. Select the **Freeze** key to freeze the image.
 5. Review the image.
 - Magnify the image
 - a. Rotate the function key corresponding to **TOGGLE PIP** to enable the Picture-In-Picture feature.
A thumbnail is displayed at the bottom left of the screen, as shown in Figure 9-4.

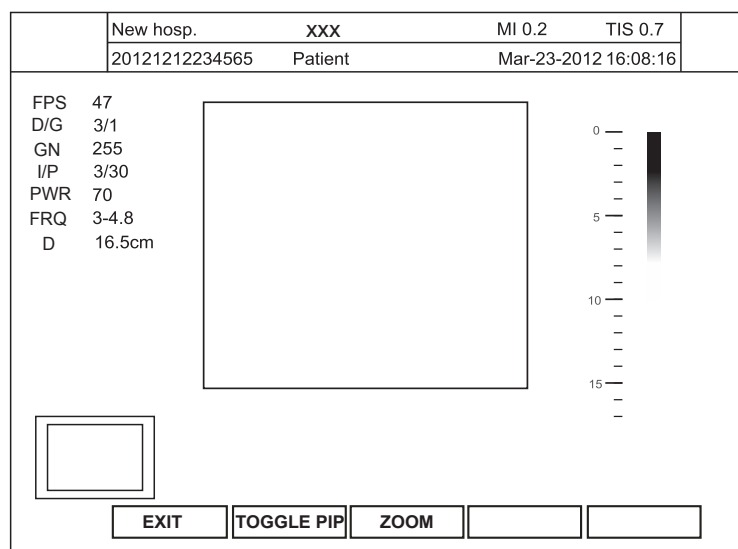


Figure 9-4 Real Time Panoramic Imaging

- b. Rotate the function key corresponding to **ZOOM** and the ROI is displayed on the thumbnail.
 - c. Select the desired area by using the trackball, and rotate the function key corresponding to **ZOOM** to magnify this area.
- Perform measurement or add the body mark or annotation on the image.
6. Rotate the function key corresponding to **QUIT** to exit Panoramic Imaging.

NOTE:

During measurement, select **Clear** to remove the current measurements before exiting the mode.

■ Perform the following steps to apply the frozen Panoramic imaging.

1. Optimize the B-mode image, and select the **Freeze** key to freeze the image.
2. Rotate the function key corresponding to **PANORAMIC**, and the initialization message appears on the screen.

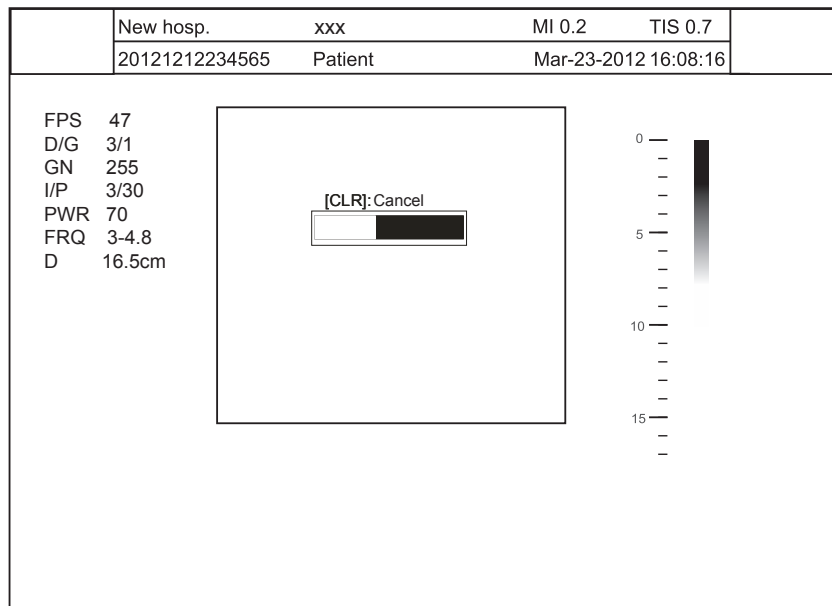


Figure 9-5 Panoramic Imaging Screen

Selecting the **Clear** key on the control panel can abort the initialization.

3. Review the image
 - Magnify the image
 - a. Rotate the function key corresponding to TOGGLE **PIP** to enable the Picture-In-Picture feature.
A thumbnail is displayed at the bottom left of the screen.
 - b. Rotate the function key corresponding to ZOOM and the ROI is displayed on the thumbnail.
 - c. Select the desired area by using the trackball, and rotate the function key corresponding to ZOOM to magnify this area.
 - Perform measurement, or add the body mark or annotation on the image.
4. Rotate the function key corresponding to **QUIT** to exit Panoramic Imaging.

NOTE:

During measurement, select **Clear** to remove the current measurements before exiting the mode.

9.2 Magnifying an Image

You can magnify an interest region on the imaging area.

NOTE:

The image can also be magnified in the frozen mode.

To magnify an image:

1. Select **Zoom** on the control panel to enable this feature.
A size multiplier is displayed in the information area of the basic screen, a thumbnail is displayed in the lower left corner of the basic screen, and the magnified image is displayed on the imaging area of the basic screen.
2. Position ROI by using the trackball.
3. Rotate the **Angle** knob on the control panel to adjust the magnification.

9.3 Freezing an Image

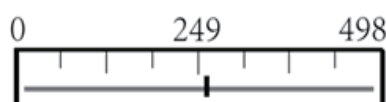
Selecting the **Freeze** key on the control panel to freeze the image, the system enters the Cine mode by default.

Or, you can select other display modes after freezing the image on **System Settings** menu, for example, annotation, measurement menu, body mark, arrow or distance measurement. For details, refer to 4.1.1 General Settings.

You can select any desired image mode, magnify the image, perform measurement, add annotation and body marks, adjust imaging parameters in the frozen mode.

9.4 Using Cine

The cine review is available by selecting the **Freeze** key in the real time scan, and **Cine** appears on the screen.



You can review the cine manually or automatically, and can also cut the desired cine segments.

9.4.1 Reviewing Cine

■ To review the cine manually

To review the cine by the following two ways.

- You can review the cine frame by frame by using the trackball.
- Or, select the **Menu** key, and select **FRAME BY FRAME** on the pop-up menu. Rotate the **Menu** key or select <- or -> key to review the cine frame by frame.

Each image is identified by the number which indicates its position of the cine.

NOTE:

- You can adjust **CHROMA** and **GSC** parameters when reviewing cine .

- You can select **START** or **END** on the pop-up menu, rotate the **Menu** key or select <- or -> key to review the first or last frame.
- To review the cine automatically
Rotate the function key corresponding to **PLAY/STOP** in the frozen B mode to play or stop the cine review automatically.
Or, rotate the function key corresponding to **LOOP SPEED** to adjust the review speed during the cine review.

9.4.2 Cutting Cine

To cut a cine:

1. Use the trackball to select the starting frame of cine in the frozen mode and select the **Update** key.
2. Use the trackball again to select the ending frame and select the **Update** key.
3. Select **Save** on the control panel to save the cut cine.

9.5 Annotations and Body Marks

The annotation feature provides you to type or add an annotation from the predefined annotation library. Arrows and body marks are also provided to annotate the image. You can make annotations or arrows on the image in the frozen or real time scan.

9.5.1 Annotating an Image with Typed Words

Perform the steps as follows:


1. Select the **Annot** key on the control panel in any mode. A yellow vertical mark appears on the screen. And the predefined annotations appears at the top left of the screen.
2. Move the mark to the desired place by using the trackball.
3. Select the **T-ball** key and use the trackball to select the added annotation. Then select the **Set** key to add the annotation on the image.
4. Select the **T-ball** key again to confirm.
5. Repeat the above steps to add more annotations if necessary.
6. Select **Annot** again to exit.

You can also perform the following operations when adding annotation.

- To input the annotation manually
Input the desired annotation by using the keyboard. After finishing, select the **Set** key to add the annotation on the image.
- To move the annotation
Move the cursor on one annotation. Select the **Set** key to activate this annotation and move it to the desired place by using the trackball. Then select the **Set** key to confirm.
- To revise the annotation
Move the cursor on one annotation and revise it by using the keyboard.

9.5.2 Annotating an Image with Arrows

Perform the steps as follows:

1. Select  on the control panel in any mode.
2. Position the arrow to the desired place by using the trackball, and select the **Set** key to add it on the image.
If necessary, rotate the **Angle** knob to adjust the arrow angle and select **Set** to confirm.
3. Repeat the above steps to add more arrows if they are needed.

9.5.3 Body Mark

Perform the steps as follows:

1. Select **Body Mark** on the control panel in any mode.
2. Position the body mark to the desired place by using the trackball, and select the **Set** key to add it on the image.
If necessary, rotate the **Angle** knob to adjust the angle.
3. Select the **Set** key to confirm.

9.5.4 Deleting Annotations and Body Marks

■ To delete annotations

If an annotation is being edited, you can select **Clear** or **Delete** on the control panel to delete it from the screen.

If an annotation has been edited and the ultrasound system exits the editing status, you can firstly select the **Annot** key, move the cursor on the annotation by using the trackball, and then select the **Set** key to select it. After the selection, select **Clear** or **Delete** to delete it from the screen.

NOTE:

You can enable the annotation-cleared feature. For details, refer to Section 4.1.1 General Settings.

■ To delete arrows

Select the **Clear** key to delete it.

■ To delete body marks

Select the **Clear** key to delete it.

NOTE:

When annotations and body marks have been edited and the ultrasound system exits the editing status, you can select **Clear** on the control panel to delete all annotations and body marks from the image. Perform the deletion with cautions.

9.6 Using ECG

Using an optional ECG module (Type BF), 3-channel ECG signals are provided in cardiac applications.

During a cardiac application, you can configure the ECG-control so that the ECG trace is displayed at the bottom of the screen. The ECG module provided by this ultrasound system is for collecting and displaying 3-lead ECG trace.

The ECG cable includes three color-coded ECG electrode connectors, i.e., LL (left leg, red), LA (left arm, black), and RA (right arm, white). Among them, LA is the reference cable, receiving the signal from the ECG module and providing the bias voltage. LL and RA receive signals from the patient body and connect to the different output terminals of ECG isolation amplifier.



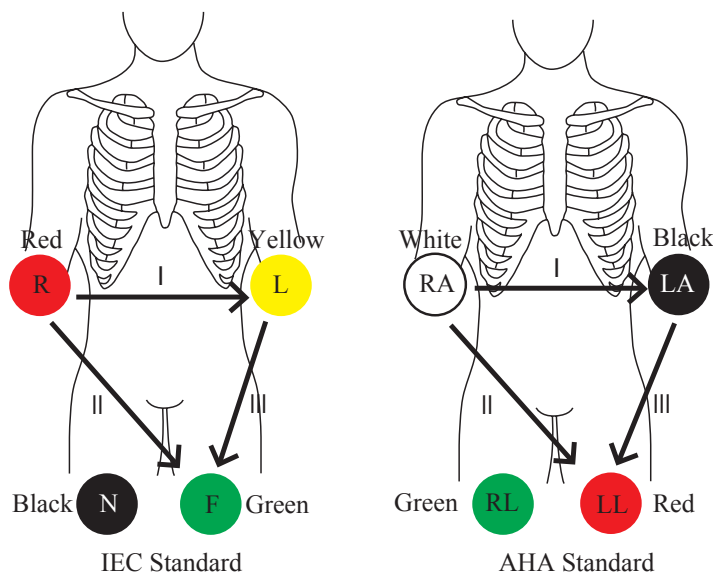
WARNING

- This ECG module is not suitable for intracardiac use or direct cardiac contact.
- This ECG module provides 3-channel ECG signals, and cannot be used for diagnosis and monitoring.
- To avoid electric shock, ensure the ECG cable is intact and be correctly connected.
- Conductive parts of electrodes and connectors for ECG should not contact other conductive parts including earth/grounding.
- Power off the ultrasound system if the patient is found to use the pacemaker or implantable cardioverter-defibrillators, because the ultrasound system may interfere with these devices.

9.6.1 Basic Procedures of ECG Operation

Perform the steps as follows:

1. Power off the ultrasound system, and connect the ECG cable to the specific port of the ultrasound system.
2. Power on the ultrasound system, and attach the ECG electrodes on the patient's body (as shown in the following figure).



3. Make the relevant settings of the ECG module. For details, refer to Section 9.6.2 Optimizing Parameters.
4. Freeze the images and review them. For details, refer to Section 9.6.3 Reviewing ECG.
5. Exit the ECG mode, and remove ECG electrodes from the patient.

9.6.2 Optimizing Parameters

Select the **Menu** key and then select **ECG** on the pop-up menu. Rotate the **Menu** key or select **<-** or **->** key to display the submenu of the ECG module.

Item	Description
ECG	Enable or disable the ECG function.
ECG GAIN	Set the amplitude of the ECG waveform. Choose from: 1, 2, 3, 4, 5, 6
ECG POSITION	Set the vertical position of the ECG waveform. Choose from: 1, 2, 3, 4, 5, 6, 7, 8
ECG INVERT	Enable or disable the waveform inversion function. Choose from: On or Off
R-TRIGGER	Enable or disable the R-trigger function. Set it to ON , R-TRIGGER menu pops up, including several items to be chosen. NOTE: Only phased probes are available for R-trigger function.
TRIGGER DELAY	Delay of trigger after the 2D refresh.
FRAME COUNT	Set the number of the image transmitted in one second.
FRAME INTERVAL	Set the refresh interval of 2D image.

9.6.3 Reviewing ECG

Select the **Freeze** key on the control panel to freeze an image, and the ECG waveform is frozen at the same time. Using the trackball to review the ECG waveform frame by frame. The ECG waveform is the reference for time.

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Chapter 10 Managing Images/Data

Images in this ultrasound system include frame images and cine, you can save or review them after the acquisition. Meanwhile, images can be also backed up to the USB device or DVD for future review if it is needed.

10.1 Storing an Image

NOTE:

All images are stored to the ultrasound system by default when storing them. They can also be backed up to the USB device or DICOM server. For details, refer to Section 10.3 Backing up Data and Section 11.2 DICOM Storage.

You can save images in the following two ways.

10.1.1 Storing an Image Automatically

Except images acquired in the 3D and 4D modes, other images or data can be saved by one defined key. Perform the following steps to store an image.

1. Set **One Key Store** to **ON** on the **System Setting -> General -> Storage** menu.
2. Select the **Save** key on the control panel in the real time or frozen mode for less than 3 seconds, and then the current image can be saved.
Or, select the **Save** key in the frozen mode for more than 3 seconds, and then the current cine can be saved.
The system beeps if the image is saved successfully. Meanwhile, the corresponding thumbnails for the stored image or cine also appears in the clipboard.

10.1.2 Storing an Image Manually

All images and cine can be saved manually, they are named after the saving date and time.

Perform the following steps to store an image.

1. Set **One Key Store** to **ON** on the **System Setting -> General -> Storage** menu.
2. Select the **Save** key in the frozen mode, a dialogue box pops up on the screen.
3. Select **Image** in the pop-up dialogue box, and select **Set** to save the current image.
Select **Cine** in the pop-up dialogue box and then select **Set** to save the current cine.
Or, select **Volume** in the dialogue box in the 3D/4D mode and then select **Set** to save the volume data.





The system beeps if the image is saved successfully. Meanwhile, the corresponding thumbnails for the stored image or cine also appears in the clipboard.

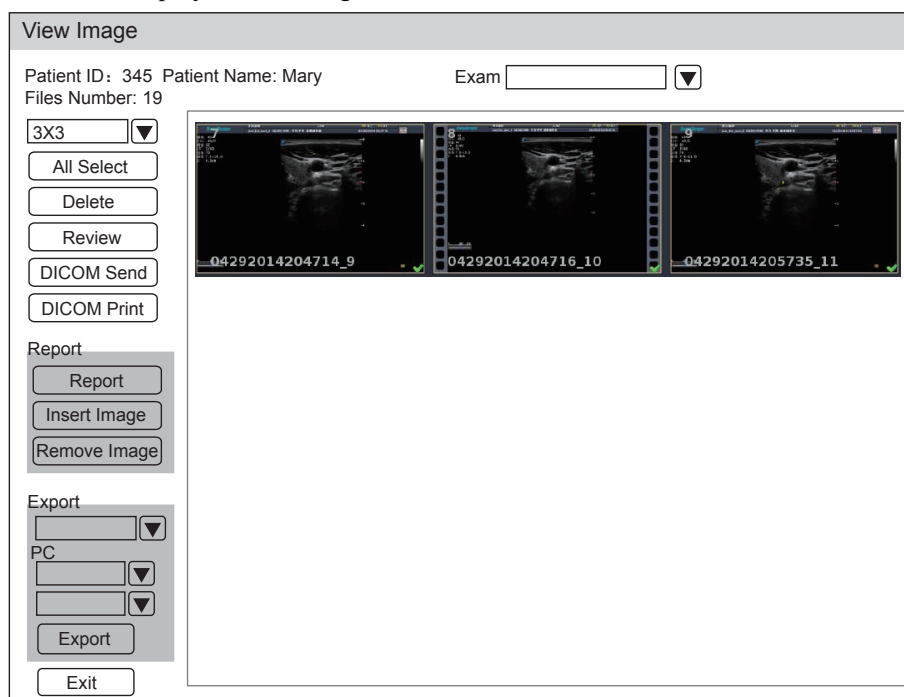
Selecting the **Save** key in the real time mode can only save the current image.

10.2 Viewing the Image/Cine

You can view an image or a cine for the current or the examined patient by using the clipboard or the **REVIEW** screen.

10.2.1 Viewing the Current Image/Cine

- To view the image/cine by using the clipboard:
 1. Select the **T-ball** key in the real time scan or frozen mode.
 2. Select an image or a cine in the clipboard at the bottom of the screen by using the trackball and select the **Set** key to view the image/cine.
 - Click  to select all images/cines.
 - Click  or  key to go to the previous or next clipboard page.
 - Click  to delete the selected image/cine.
 - You can also amplify the image, review the cine and perform the measurement.
- To view the image on the **View Image** screen
 1. Select the **File** key on the control panel to enter the **View Image** screen.
The screen is displayed with images and cine thumbnails.



If the patient has taken more than one exam, you can select the desired exam from the **Exam** drop-down list.

2. Move the trackball on the thumbnails and select the **Set** key to choose one image.
3. View the image.

- Double-click **Set** to view the image.

You can select the **Freeze** key at any time to return to the **View Image** screen.

- Click **Review** to view the image.

10.2.2 Retrieving an Image

Perform the steps as follows.

1. Choose the **Patient** key -> **Patient List** -> **Patient Review** to enter the **Patient Review** screen.
2. Select the desired patient, and then click **View** to enter the **Exam Review** screen.
3. Select the desired exam, and click **View Image** to retrieve the image.

10.3 Backing up Data



WARNING

- To avoid data loss due to unexpected system breakdown or software update, you are highly recommended to make periodical data backup.
- You should complete the current exam before backing up the data.

You can back up the data to the USB device or DVD.

10.3.1 Backing up Data to the USB Device

Perform the steps as follows.

1. Connect the USB device to the ultrasound system.
2. Choose the **Patient** key -> **Patient List** -> **Patient Review** to enter the **Patient Review** screen.
3. Select **USB** from the **Import/Export** drop-down list.
4. Click **Export Screen**, and then select the exported image format.
If you select PC image format, you can also select the exported image or cine format.
5. Select the desired patient.
6. Click **Patient Export** to back up all data relevant to the patient.

10.3.2 Backing up Data to DVD

NOTE:

You should purchase the DVD drive on your own.

You can use DVD of DVD-R/RW and DVD+R/RW media types with the ultrasound system. DVD (write once, 4.7GB capacity) manufactured by SONY is recommended.

Perform the steps as follows:

1. Connect the DVD drive to the ultrasound system through the USB cable.

NOTE:

Ensure the DVD drive is connected to the ultrasound system.

2. Place an empty DVD on the tray.

NOTE:

Please make sure the DVD faces upward.

3. Choose the **Patient** key -> **Patient List** -> **Patient Review** to enter the **Patient Review** screen.
4. Select **DVD** from the **Import/Export** drop-down list.
5. Click **Export Screen**, and then select the exported path.
6. Select the desired patient.
7. Click **Patient Export** to back up all data relevant to the patient.
DVD ejects after a successful prompt is displayed.
8. Take out DVD from the DVD drive and close the tray.

10.4 Importing Data to the System

NOTE:

- Only data generated by this system can be imported.
- Ensure the current exam is completed before you import data. Otherwise, you may have a failure data import.

Perform the steps as follows.

1. Connect the USB device to the ultrasound system.
Or, place an empty DVD on the DVD drive.
2. Choose the **Patient** key -> **Patient List** -> **Patient Review** to enter the **Patient Review** screen.
3. Select the imported device from the **Import/Export** drop-down list.
4. Click **Export Screen**, and then select the imported patient information.
5. Click **Patient Import** to import the desired data.

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Chapter 11 Working with DICOM

DICOM (Digital Imaging and Communications in Medicine) is a standard created by National Electrical Manufacturers Association (ACR-NEMA) to regulate the distribution and viewing of medical images such as ultrasound images and cine.

If the ultrasound system is configured the DICOM module, you can:

- Search the archived patient information set on the DICOM server, and copy the patient information to the ultrasound system so that the correct patient can be examined.
- Send stored images or data on the ultrasound system to the DICOM server.
- Print images on a DICOM printer.

DICOM service of the ultrasound system consists of DICOM storage, storage committee, DICOM worklist, MPPS and DICOM print.

11.1 Verifying Connectivity

1. Access the ultrasound system to the local network of DICOM server by using an Ethernet cable.
2. Make the relative settings about the local network and DICOM server. For details, refer to Section 4.4 Configuring DICOM.
3. If the verification succeeds, you can apply the DICOM services.

NOTE:

Ensure the ultrasound system is connected to the server before using the DICOM service. Otherwise, the service cannot be used.

11.2 DICOM Storage

DICOM Storage is used to send patient information and the relevant images to DICOM storage server for storage.

Perform the steps as follows.

1. Connect the USB device to the ultrasound system.
2. Choose the **Patient** key -> **Patient List** -> **Patient Review** to enter the **Patient Review** screen.
3. Select the desired patient, and then click **View** to enter the **Exam Review** screen.
4. Select the desired exam.
5. Click **DICOM Send** to send the patient information and the relevant images to DICOM storage server.

If you only want to send images, select the **File** key on the control panel to enter the **View Image** screen, select the desired images, and then click **DICOM Send**.

If you want to check the sending status, choose the **Patient** key -> **Patient List** -> **DICOM Queue**.

11.3 DICOM Print

DICOM Print is used to send images to DICOM print server for printing.

You should properly connect the ultrasound system to the print server and make the relevant settings. For details, refer to

Perform the steps as follows.

1. Connect the USB device to the ultrasound system.
2. Choose the **Patient** key -> **Patient List** -> **Patient Review** to enter the **Patient Review** screen.
3. Select the desired patient, and then click **View** to enter the **Exam Review** screen.
4. Select the desired exam.
5. Click **DICOM Print** to send the patient information and the relevant images to DICOM print server.

If you only want to send images, select the **File** key on the control panel to enter the **View Image** screen, select the desired images, and then click **DICOM Send**.

If you want to check the sending status, choose the **Patient** key -> **Patient List** -> **DICOM Queue**.

11.4 DICOM Worklist

DICOM Worklist is used to search the archived patient information set on the DICOM server, and copy the patient information to the ultrasound system so that the correct patient can be examined.

Select the **Patient** key on the control panel to enter the **New Patient** screen, and then click **WorkList** to enter the **WorkList** screen.

The screenshot shows the 'WorkList' window. At the top, there are search fields for 'Patient Name', 'Patient ID', 'Accession#', and 'Requested Procedure ID', each with a corresponding 'Search' or 'Reset' button. Below these is a date range selector with 'Date' and 'To' fields, and an 'Only US' checkbox. The main area is a table titled 'Worklist Information' with columns: Patient ID, Patient Name, Birth Date, Sex, Description, Requested Procedure ID, Accession#, and Date/Time. The table is currently empty. At the bottom right, there are three buttons: 'Group Case', 'Select', and 'Cancel'.

Patient ID	Patient Name	Birth Date	Sex	Description	Requested Procedure ID	Accession#	Date/Time
------------	--------------	------------	-----	-------------	------------------------	------------	-----------

Figure 11-1 WorList Screen

Perform the steps as follows.

1. Search for the patient information
 - Enter the search requirements, such as Patient Name, Patient ID, Accession#, Exam Date/Time or Requested Procedure ID, and then click **Search** to search the desired one.
 - Clicking **Reset** can clear all the search information.
2. Start an exam
 - a. Select the desired patient.
 - b. Click **Select** to start an exam. If the desired patient has taken more than one exam, click **Group Case** to start the exam.
3. Enter patient information.

11.5 MPPS

MPPS is used to send exam status information to the MPPS server, which facilitates the other systems to obtain the exam progress in time.

The status information is described as below:

- When the exam is started, the system sends status information “In Process” to the MPPS server.
- When the exam is completed by pressing the **End Exam** key on the control panel, the system sends status information “Complete” or “Discontinue” to the MPPS server.

If you want to check the sending status, choose the **Patient** key -> **Patient List** -> **DICOM Queue**.

■ To add MPPS

You can manually add MPPS to check the processing status of the discontinued exam or other order operations.

NOTE:

MPPS can only be added when you perform the scan or other order operations.

Perform the steps as follows.

1. Choose the **Patient** key -> **Patient List** -> **Patient Review** to enter the **Patient Review** screen.
2. Click **PPS Screen** to enter the **PPS** screen.

PPS Screen						
Information						
Patient ID	Patient Name	Birth Date	Sex	Description	Date/Time	State
20140505	Mary	Unknown		IN PROGRESS		

Scheduled Procedure Step Information		
Code	Description	Meaning

Figure 11-2 PPS Screen

The **PPS** screen displays MPPS information about the current patient. If the patient information is acquired from the DICOM WorkList, the **PPS** screen will also display the relevant acquisition protocol.

3. Click **Append** to display the following dialogue box.

PPS

☐ Assisted Acquisition Protocol Setting

Code

Meaning

Designator

Reason ▼

4. Click **Assisted Acquisition Protocol Setting**, and then enter the relevant information to code, meaning and designator.
5. Click **Completed** to end the order operation.
Or, you can also click **Discontinued** as you need.

11.6 Storage Commitment

Storage commitment is used to confirm whether the images or structured reports are successfully stored to the DICOM storage server.

If you want to check the sending status, choose the **Patient** key -> **Patient List** -> **DICOM Queue**.

11.7 DICOM Queue

DICOM Log is used to check the sending state of DICOM storage, DICOM print, MPPS.

Choose the Patient key -> Patient List -> DICOM Queue to enter the DICOM Queue screen.

DICOM Queue

Patient ID Patient Name

Date 05/04/2014 To 05/05/2014 Type ▼

DICOM Queue Information

<input type="checkbox"/>	Type	Patient ID	Patient Name	Server	Start Time	Size	Run State	Status	Details
<input type="checkbox"/>	MPPS	20140505	Mary	AE	05/05/2014-16:04:03	0M	Finish	Fail	Association Request Failed

Figure 11-3 DICOM Queue Screen

Perform the steps as follows.

1. Search for the patient information
Enter the search requirements, such as Patient Name, Patient ID, Type or Exam Date/Time, and then click **Search** to search the desired one.
2. Check the sending status
You can check the sending status by viewing **Run State**, **Status** or **Details**.
3. Deal with the failure sending information
 - Select the desired patient information, click **Refresh** to refresh the patient information. If it does not work, you can click **Resend** to resend the information.
 - Click **All Select** -> **Resend Fail** to resend the information.
 - Select the desired patient information, click **Delete** to delete the information.

Chapter 12 Probes and Biopsy

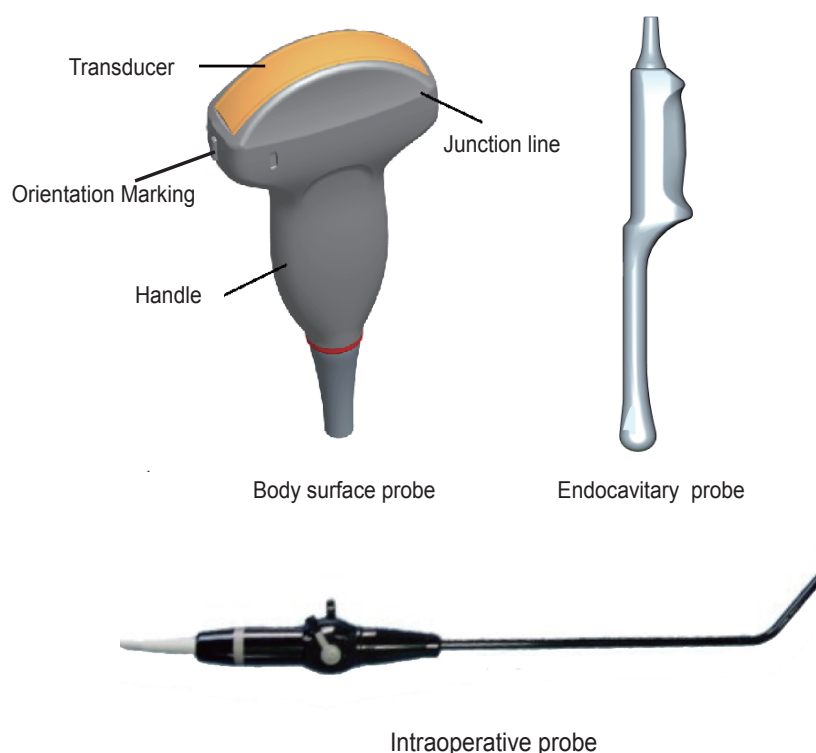
You should be thoroughly familiar with the operations of the probe and the biopsy bracket before using them. To ensure the performance and availability of the probe and the biopsy bracket, you should also periodically check, clean, disinfect or maintain them.

NOTE:

A general instruction for the probe is provided in this manual. For details, refer to the relevant manuals.

12.1 Probe

This ultrasound system supports a wide range of probes which make the system remarkably versatile.

**12.1.1 Available Probes**

The available probes are listed as follows:

Probe Model	Application
C322, C344, C345, C353, C354, C362, C542, C544, C5-1, VC6-2, VC8-3, C611, C613, L541, L741, L742, L743, L744, L752, 10L1, VL12-5, 2P1, 2P2, 5P2, 8P1, 3P1, 5P1, P5-1, CWD2.0, CWD5.0, CWD8.0, PWD2.0	Body surface
6V3, 6V1, 6V1A, EC9-5, BCL10-5, BCC9-5, VE9-5, MPTEE mini, MPTEE,	Intracavitary
6CT4, 10I2, 10I3, LAP7, 7LI4	Intraoperative

12.1.2 Probe Usage



WARNING

- Do not use the probes other than those provided by the manufacturer. Otherwise, the ultrasound system cannot be performed, and an accident such as a fire may result in the worst case.
- Use the probe carefully. If any part of the probe surface is scratched, immediately stop using the probe. Otherwise, there is a danger of electric shock.
- Use of legally marketed probe sheath is required for intracavitary operations. If lubricant is used, it must be water-soluble. Do not apply coupling gel directly on the patient skin.
- Use the legally marketed coupling gel in accordance with the relevant local regulations. Read and understand all precautions in the relevant manual of the coupling gel before using it.

■ Special concerns before probe usage:

Inspect the probe before each use. In case the following damage is found, stop using the probe immediately.

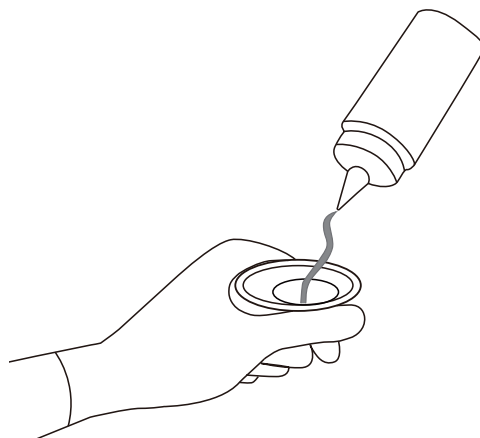
- Cracks on the probe handle (user section).
- Cracks on the transducer surface (applied section).
- Scratches on the transducer surface (acoustic window surface).
- Swell of the acoustic window material.
- Cracks or wear on the probe cable.
- Cracks on the probe connector or any other kinds of visible damage.
- Deformed pins or broken pins exist inside the probe connectors.
- Damage or deformation on the probe cable.

■ Body surface probe usages

1. Wear medical sterile gloves.
2. Orient the probe
3. Perform a scan.

■ Endocavitary probe usages

1. Wear medical sterile gloves.
2. Wear the probe sheaths (only for the endocavitary probes)
 - a. Remove the packaging and unfold the probe sheath.
 - b. Apply an appropriate amount of coupling gel to the inside of the sheath and onto the face of the probe.
 - c. Hold the probe and unroll the sheath onto the probe.
 - d. Pull the probe sheath tightly over the face of the probe to remove wrinkles.
 - e. Secure the sheath to the probe with the adhesive tapes or elastic bands provided.
 - f. Remove the sheath from the probe, and dispose of the sheath in accordance with the local laws and regulations.



3. Orient the probe
Check the probe orientation mark before the scan.
The image acquired from the mark side of the probe is displayed on the monitor.
4. Perform a scan.

12.1.3 Cleaning the Probe



WARNING

- To avoid probe damages, do not bump the probe on hard surfaces during the cleaning.
- To avoid the electric shock, disconnect the probe from the ultrasound system before the cleaning.
- To avoid the potential disease transmission, you should wear medical sterile gloves and protective goggles during the cleaning.

You should clean the probe after each use.

Perform the following steps to clean the probe.

1. Disconnect the probe from the ultrasound system, and remove the probe sheath and the biopsy bracket from the probe.
2. Use a lint-free soft cloth dampened with mild soapy water to wipe the probe.
 - If the probe carries blood, body fluid or dried stains, you should wipe it with enzymatic cleaner.

NOTE:

Follow the manufacturer's instructions to make up the enzymatic cleaner.

- If there are stains on surface or grooves of the probe, you should use a brush dampened with portable water to remove them.

3. Rinse the surfaces of the probe with the fresh running water to remove the residual cleaner completely.
4. Dry the probe with a lint-free soft dry cloth.

12.1.4 Disinfecting or Sterilizing the Probe



WARNING

- Use the liquid disinfectant/sterilant that meets the local laws and regulations.
- If you use the recommended disinfectant/sterilant, ensure its level and the probe soaking period meets the requirements. Otherwise, the probe could be damaged and your warranty might be void. If you have other use or needs, ensure the level of the make-up disinfectant/sterilant and the probe soaking period are suitable for the intended clinical application.
- Do not use the expired disinfectant/sterilant.
- Store the probe in a sterile environment, and mention its expiry date before use.
- Do not disinfect/sterilize the probe through autoclaving or contact with ethylene oxide.
- Do not use thermal disinfection/sterilization. Temperatures higher than 66°C (150°F) will damage the probe.
- Not allow any disinfectant/sterilant to be air-dried on the probe.

■ Disinfection Levels

To choose an appropriate disinfectant, you first must determine the required level of disinfection, based on the probe classification.

Classification	Definition	Level of Disinfection	Application
Critical	Device enters otherwise sterile tissue (intraoperative applications)	Sterilization	Intraoperative, biopsy use or blood contacting probe
Semi-critical	Device contacts mucous membranes (intracavity applications)	High	Endocavitary probe
Noncritical	Device contacts intact skin	Medium or low	Body surface probe

■ Soaking Requirements

Do not immerse the probe beyond its junction line.

NOTE:

Disinfectants listed in this manual are recommended because of their chemical compatibility with product materials, not their biological effectiveness. For the biological effectiveness of a disinfectant, refer to the guidelines and recommendations of the disinfectant manufacturer, Association for Practitioners in Infection Control, U.S. Food and Drug Administration, and U.S. Centers for Disease Control.

■ To disinfect the body surface probe

You should disinfect the surface probe after each use.

Perform the steps as follows:

1. Clean the probe.
For details, refer to Section [Cleaning the Probe](#).
2. Perform the medium-level disinfection to the surface probe as shown in Table 12-1 until the recommended disinfection period expires.

NOTE:

If you do not use the recommended disinfectant, make up it as the manufacturer's instructions.

3. Rinse the probe with the fresh running water to remove the residual disinfectant completely.
4. Dry the with a lint-free soft dry cloth.

Table 12-1 Recommended Method for Medium-level Disinfection

Disinfectant	Manufacturer	Active Ingredient	Level for Active Ingredient	Contact Type	Contact Period
70% Isopropyl alcohol	ALL	70% Isopropyl alcohol	70%	Spray / Wipe	<10 minutes
T-spray II	Pharm. Inc.	Quat. Ammonia	/	Spray / Wipe	<10 minutes
T-spray	Pharm. Inc.	Quat. Ammonia	/	Spray / Wipe	<10 minutes

■ To disinfect the endocavitary probe

You should disinfect the endocavitary probe before and after each use.

Perform the steps as follows:

1. Clean the probe.
For details, refer to Section [Cleaning the Probe](#).
2. Perform the high-level disinfection to the surface probe as shown in Table 12-2 until the recommended soak period expires.

NOTE:

If you do not use the recommended disinfectant, make up it as the manufacturer's instructions.

3. Rinse the probe with the running sterile water to remove the residual disinfectant completely.
4. Dry the probe with a lint-free soft dry cloth.

Table 12-2 Recommended Method for High-level Disinfection

Disinfectant	Manufacturer	Active Ingredient	Level for Active Ingredient	Contact Type	Contact Period
Cidex™ Activated Dialdehyde Solution	J&J	Glutaraldehyde	2.4%	Soak	45 - 50 minutes
Resert XL HLD	STERIS	2.0% H2O2	2.0%	Soak	8 minutes

12.1.5 Sterilizing the Probe

You should sterilize the Intraoperative, biopsy use or blood contacting probe after each use.

Perform the steps as follows:

1. Clean the probe.
For details, refer to Section 12.1.3 Cleaning the Probe.
2. Sterilize the intraoperative probe as shown in Table 12-3 until recommended soak period expires.

NOTE:

If you do not use the recommended sterilant, follow the manufacturer's instructions to make up it.

3. Rinse the probe with the running sterile water to remove the residual sterilant completely.
4. Dry the probe with a lint-free soft dry cloth.

Table 12-3 Recommended Method for Sterilization

Disinfectant	Manufacturer	Active Ingredient	Level of Active Ingredient	Contact Type	Contact Period
Cidex™ Activated Dialdehyde Solution	J&J	Glutaraldehyde	2.4%	Soak	10 hours

12.1.6 Disinfecting and Sterilizing the Probe Cable



WARNING

- Do not immerse the probe connector or handle into disinfectant or sterilant.
- To avoid potential disease transmission, you should wear medical sterile gloves and protective goggle during the disinfection or serialization.
- Do not immerse the probe cable into alcohol or isopropyl alcohol at any concentration for a long period. Avoid any contact with iodine or phenols.

■ Daily Disinfection

Perform the following steps to clean the probe cable.

1. Use a lint-free soft dry cloth dampened with mild soapy water to wipe the probe cable.
2. Perform the medium-level disinfection to the surface probe as shown in Table 12-4 until the recommended disinfection period expires.

NOTE:

If you do not use the recommended disinfectant, follow the manufacturer's instructions to make up it.

3. Rinse the surfaces of the probe cable with the fresh running water to remove the residual disinfectant completely.
4. Dry the probe cable with a lint-free soft dry cloth.

Table 12-4 Recommended Method for Medium-level Disinfection

Disinfectant	Manufacturer	Active Ingredients	Level of Active Ingredients	Contact Type	Contact Period
T-spray II	Pharm. Inc.	Quat. Ammonia	/	Spray/ Wipe	<10 minutes
T-spray	Pharm. Inc.	Quat. Ammonia	/	Spray/ Wipe	<10 minutes

■ Sterilization

If the probe cable contacts with any blood or body fluid, you should sterilize it. For details, refer to Section 12.1.5 Sterilizing the Probe.

12.1.7 Storage and Transportation

You should operate, store and transport the probe in accordance with Appendix A Specifications.

■ To transport the probe

1. Ensure the probe is cleaned and disinfected before the transportation.
2. Place the probe fully into the carrying case, and carefully wind the cable.
3. Ensure no parts of the probe left outside the carrying case before the package.
4. Pack the carrying case with sponge, and place it in a carton.

■ To store the probe

The following items are recommended to be performed for the storage.

- Always store the probe in the probe holder or the specific package.
- Ensure the probe holder or the specific package is clean.
- Do not expose it in direct sunlight or environmental temperature of sudden changes.
- Store the probe alone to avoid any impact on the probe head.
- Carefully wind the probe cable.
- Dry the probe before the storage.

12.2 Biopsy

You should properly assembly and verify the biopsy bracket before performing the biopsy.



WARNING

- Only use the biopsy bracket in conjunction with the probe provided by the manufacturer. Otherwise, the ultrasound system and probe may be damaged, an accident such as a fire may result in the worst case.
- Only the trained physicians or sonographers under ultrasound guidance can handle the biopsy needle guides. During the operation, the operator must observe proper needle insertion sequencing with the needle guide in order to avoid undue discomfort and unnecessary risk and injury to the patient.
- You should activate the biopsy guidelines before performing a biopsy.
- The biopsy guidelines that display on the monitor are intended as a reference. It is the operator's responsibility to verify correct positioning of the needle during a biopsy.
- Do not freeze an image when performing a biopsy.
- To avoid hurt the patient accidentally, the operator should be highly concentrated during a biopsy.
- The biopsy needle is disposable.
- To avoid the infection, disinfect the probe and wear it with the probe sheath performing a biopsy.
- To avoid possible personnel injury, the operator should perform the biopsy using an appropriate biopsy bracket.
- You should verify the biopsy bracket before performing a biopsy.

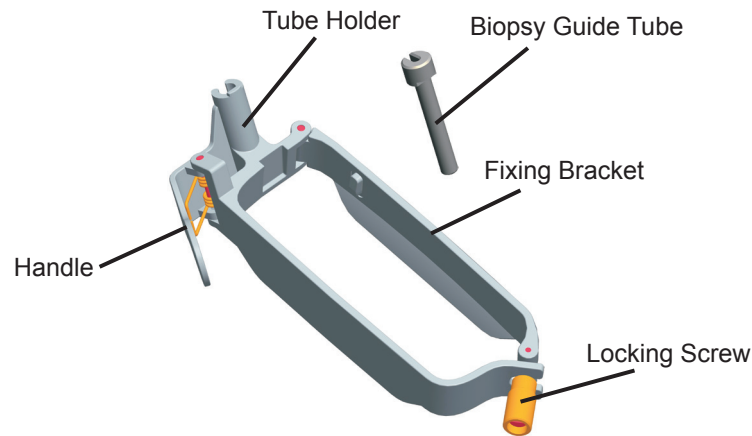
12.2.1 Available Biopsy Brackets

Biopsy Bracket Model	Available Probe Model	Available Biopsy Needle	Application
NGBC322	C322	14G, 16G, 18G, 20G	Body surface
NGBC344	C344	14G, 16G, 18G, 20G, 22G	Body surface
NGBC345	C345	14G, 16G, 18G, 20G, 22G	Body surface
NGBC3353	C353	14G, 16G, 18G, 20G, 22G	Body surface
NGBC354	C354	14G, 16G, 18G, 20G, 22G	Body surface
NGBC362	C362	14G, 16G, 18G, 20G, 22G	Body surface
NGBC542	C542	14G, 16G, 18G, 20G, 22G	Body surface
NGBC544	C544	14G, 16G, 18G, 20G, 22G	Body surface
NGBC5-1	C5-1	14G, 16G, 18G, 20G, 22G	Body surface

Biopsy Bracket Model	Available Probe Model	Available Biopsy Needle	Application
NGB6CT4	6CT4	14G, 16G, 18G, 20G, 22G	Intraoperative
NGB6V1	6V1	16G, 18G, 20G, 22G	Intracavity
NGB6V3	6V3	16G, 18G, 20G, 22G	Intracavity
NGBC611	C611	14G, 16G, 18G, 20G, 22G	Body surface
NGBC613	C613	14G, 16G, 18G, 20G, 22G	Body surface
NGBEC9-5	EC9-5	16G, 18G, 20G, 22G	Intracavity
NGBBCL10-5	BCL10-5	14G, 16G, 18G, 20G, 22G	Intracavity
NGBBCC9-5	BCC9-5	16G, 18G, 20G, 22G	Intracavity
NGBVE9-5	VE9-5	14G, 16G, 18G, 20G, 22G	Intracavity
NGBL541	L541	14G, 16G, 18G, 20G, 22G	Body surface
NGBL741	L741	14G, 16G, 18G, 20G, 22G	Body surface
NGBL742	L742	14G, 16G, 18G, 20G, 22G	Body surface
NGBL743	L743	14G, 16G, 18G, 20G, 22G	Body surface
NGBL744	L744	14G, 16G, 18G, 20G, 22G	Body surface
NGBL752	L752	14G, 16G, 18G, 20G, 22G	Body surface
NGB10L1	10L1	14G, 16G, 18G, 20G, 22G	Body surface
NGBLAP7	LAP7	14G, 16G, 18G, 20G, 22G	Intraoperative
NGBC322	7LI4	14G, 16G, 18G, 20G, 22G	Intraoperative
NGB2P1	2P1	14G, 16G, 18G, 20G, 22G	Body surface
NGB2P2	2P2	14G, 16G, 18G, 20G, 22G	Body surface
NGB3P1	3P1	14G, 16G, 18G, 20G, 22G	Body surface
NGB5P1	5P1	14G, 16G, 18G, 20G, 22G	Body surface
NGBP5-1	P5-1	14G, 16G, 18G, 20G, 22G	Body surface

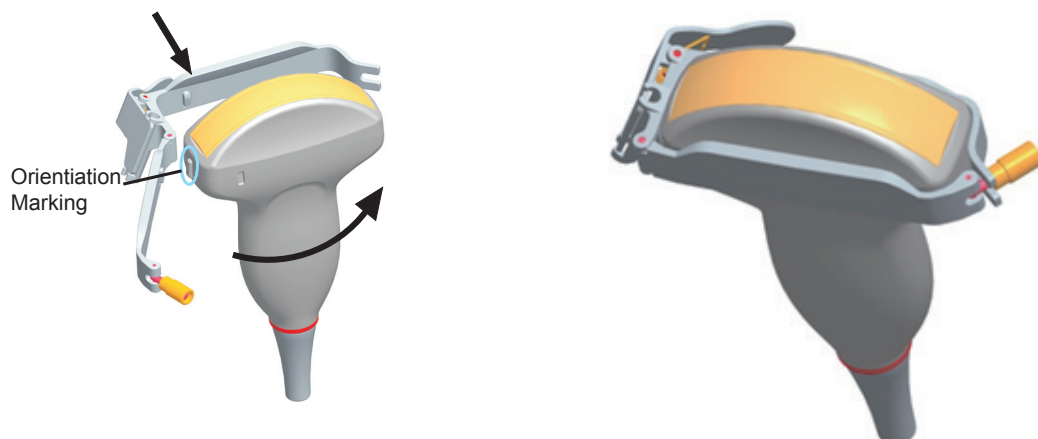
12.2.2 Assembling the Biopsy Bracket

- To assemble the surface biopsy bracket

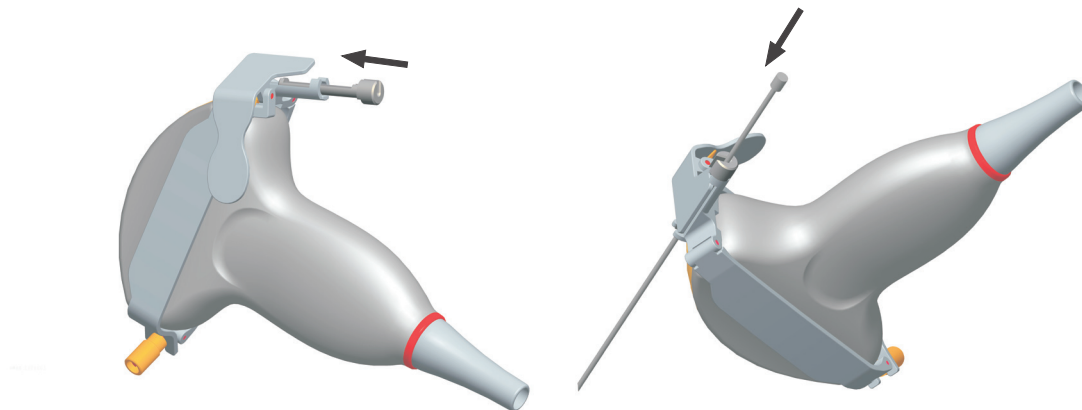


Perform the steps as follows:

1. Ensure there is no damage, deformation, malfunction, loose or missing some parts on the biopsy bracket before the assembly.
2. Wear sterile gloves.
3. Unfold the probe sheath, and apply an appropriate amount of coupling gel to the inside of the sheath and onto the face of the probe.
4. Hold the probe and unroll the sheath onto the probe. Pull the probe sheath tightly over the face of the probe to remove wrinkles.
5. Align the biopsy bracket with the orientation marker of probe.
6. Attach the biopsy bracket to the probe and fasten the biopsy bracket with the locking screw.
7. Press the tube clamp and insert the biopsy bracket tube into the biopsy bracket.

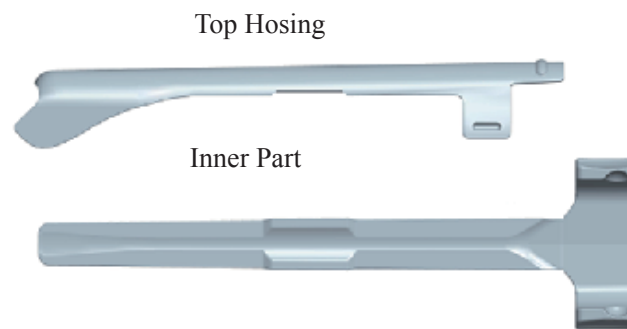


8. Insert the biopsy needle into the tube.



9. Make sure that the biopsy bracket is attached to the probe firmly.

■ To assemble the endocavitary biopsy bracket



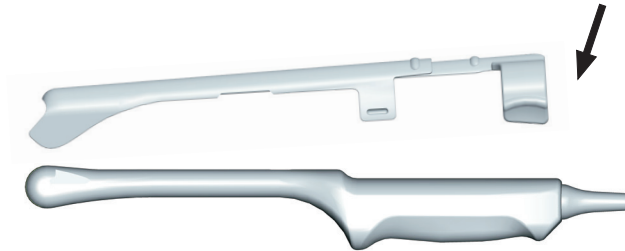
Perform the steps as follows:

1. Ensure there is no damage, deformation, malfunction, loose or missing some parts on the biopsy bracket before the assembly.
2. Wear sterile gloves.
3. Assemble the metal top housing and biopsy bracket.
4. Slide the inner part into the top housing and push forward until it clicks.



5. Unfold the probe sheath, and apply an appropriate amount of coupling gel to the inside of the sheath.
6. Hold the biopsy bracket and unroll the sheath onto it.
7. Unfold another probe sheath, and apply an appropriate amount of coupling gel to the inside of the sheath and the probe. Hold the probe and unroll the sheath onto the probe.

8. Pull the probe sheath tightly over the face of the probe to remove wrinkles.
9. Align the tip of biopsy bracket with the left and right grooves on the head of probe.
10. Hold the tip of bracket and the head of the probe, and push the other end of the bracket towards the probe to attach it on the probe.



11. Check the bracket has been attached firmly on the probe. If the assembly is loose, please reattach the biopsy bracket.

12.2.3 Preparing for a Biopsy

You should prepare the following items before performing the biopsy.

- New, straight, biopsy needle
- Sterilized container of sterile and degassed water
- Probe attached with biopsy needle
- Activated biopsy guidelines
- Sterile sheath

12.2.4 Verifying the Biopsy Bracket

NOTE:

Ensure the biopsy bracket is properly attached to the compatible probe before the verification.

Perform the steps as follows:

1. Select the **Menu** key to open the menu and then select **BIOPSY** in a real time B-mode.
2. Immerse the probe head into the degassed water.
3. Insert the biopsy needle into the maximum depth of the water.
4. Verify that the path of the needle displays according to the guidelines shown on the image screen.
After verification, the needle guide is ready for use.



WARNING Do not use a needle guide if the path of the needle is not accurately indicated by the on-screen guidelines. The path of the needle must display within the guidelines. Contact the manufacturer or the local distributor if the needle path is not accurately indicated.

12.2.5 Performing a Biopsy

NOTE:

Ensure the biopsy bracket is properly attached to the compatible probe and be verified before you perform a biopsy.

Perform the steps as follows:

1. Select the **Menu** key and then select **BIOPSY** on the pop-up menu in a real time B-mode.
2. Perform a scan to locate the target.
3. Perform the puncture by sliding the needle through the groove in the guide until the needle, as shown on the display, intercepts the target.
You can select the **OFFSET** or **ANGLE** on the menu, rotate the **Menu** key or select the **<- or->** key to adjust the biopsy guideline.
4. Gently remove the probe from the patient after completing the biopsy.

12.2.6 Cleaning the Biopsy Bracket

**WARNING**

- Clean the biopsy bracket after each use.
- Wear medical sterile gloves and protective goggle during the cleaning.

Perform the steps as follows:

1. Disconnect the probe from the ultrasound system, and remove the biopsy bracket and biopsy guide tube from the probe.
2. Brush and rinse the bracket with enzymatic cleaner to remove the residue.

NOTE:

Make up the enzymatic cleaner as the manufacturer's instructions.

3. Dry the bracket with a lint-free soft dry cloth.

12.2.7 Sterilizing the Biopsy Bracket

**WARNING**

- Disinfect the biopsy bracket after each use.
- Use the liquid sterilant that meets the local laws and regulations.
- If you use the recommended sterilant, ensure its level and the probe soaking period meets the requirements. Otherwise, the biopsy bracket could be damaged and your warranty might be void. If you have other use or needs, ensure the level of the make-up sterilant and the biopsy bracket soaking period are suitable for the intended clinical application.
- Do not use the expired sterilant.
- If you use other contact type to sterilize the biopsy bracket, ensure it is guaranteed by the manufacturer or the local distributor.
- Do not sterilize the plastic biopsy bracket through autoclaving. Avoid biopsy brackets of any kinds contacting with ethylene oxide

- Not allow any sterilant to be air-dried on the biopsy bracket.



- Some sterilants are acid or alkaline, the operator should take cautions in preventing hands or clothing from being directly contact with them. Wash hands or eyes immediately if they are contaminated by the disinfectants.
- Dispose of the cleaners, sterilants or discard solutions in accordance with the local standards or regulations.

Perform the steps as follows:

1. Clean the biopsy bracket.
For details, refer to Section 12.2.6 Cleaning the Biopsy Bracket.
2. Sterilize the biopsy bracket as shown in Table 12-5.

NOTE:

If you do not use the recommended sterilant, make up it as the manufacturer's instructions.

3. Take out the bracket from the sterilant when the recommended soak period expires.
4. Rinse the bracket with running sterile water, and then dry it with a lint-free soft dry cloth.

Table 12-5 Recommended Method for Sterilization

Sterilant	Manufacturer	Active Ingredient	Level for Active Ingredient	Contact Type	Contact Period
Cidex™ Activated Dialdehyde Solution	J&J	Glutaraldehyde	2.4%	Soak	10 hour

12.2.8 Storage

The biopsy bracket should be stored in a sterile environment. The following items should be also concerned during the storage.

- Do not expose it in direct sunlight.
- Do not locate it in environmental temperature of sudden changes.
- It has been thoroughly cleaned, disinfected and air dried

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Chapter 13 System Maintenance

To maintain the safety and functionality of the ultrasound system, you should periodically perform the maintenance for the ultrasound system and accessories.

**WARNING**

- To avoid electrical shock and damage to the ultrasound system, power off and unplug the system from the AC power outlet before cleaning.
- To maintain the safety and functionality of the ultrasound system, maintenance must be performed at least every 6 months. Electrical safety tests must also be performed at regular intervals as specified by local safety regulations.

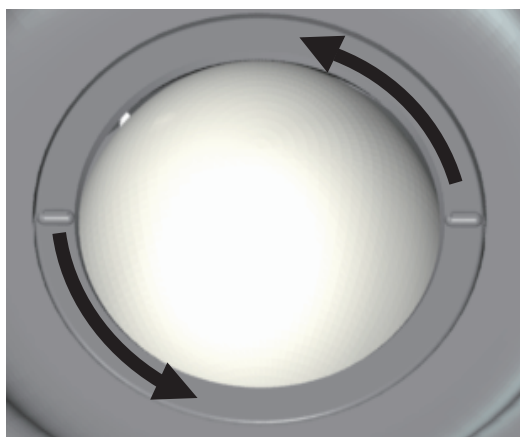
13.1 Cleaning the System

■ To clean the system surface

1. Power off and unplug the ultrasound system from the AC power outlet.
2. Dampen a lint-free soft cloth with 75% ethyl alcohol.
3. Use this lint-free soft cloth to clean the surfaces of the monitor screen, the touch screen, the control panel, the keyboard and the main unit. Take special care and avoid to scratch the screens.
4. Use a cotton swab to remove solids from between keys and controls.
5. In case of blood or any infectious, use a lint-free soft cloth dampened with 70% isopropyl alcohol.

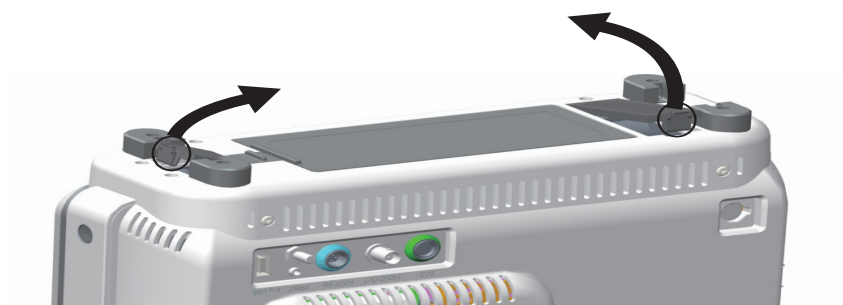
■ To clean the trackball

1. Power off and unplug the ultrasound system from the AC power outlet.
2. Press the bulges in the ring by both hands.
3. Turn the ring anticlockwise until the ring lifts.



4. Take out the ring and ball (careful not to drop the ball) from the control panel.
5. Use a lint-free soft cloth dampened with 75% ethyl alcohol to clean the trackball.
6. Use a cotton swab dampened with 75% ethyl alcohol to remove stains from the ring.
7. Place the trackball and the ring back to the control panel, press the bulges in the ring by both hands and turn the ring clockwise to install the trackball.

- To clean the dust filter



The dust filter must be clean at least every 3 months for ventilation. Power off and unplug the ultrasound system from the AC power outlet.

1. Pinch the dust filter with fingers as the figure shown above.
2. Rinse the taken out sponge with refresh running water, and use a brush to rinse the dust filter with refresh running water.
3. Place the sponge and dust filter back to the ultrasound system after a thorough airing.

13.2 Maintenance Checks

To maintain the safety and functionality of the ultrasound system, the following maintenance checks must be performed by the service personnel at least every 6 months.

1. Electric Safety

- Integrity of power cable
- Protective conductor resistance
- Ground line leakage current
- Patient leakage current
- Patient auxiliary leakage current

2. Battery Safety

Check the intactness and performance of the battery if the battery is frequently used or not used for 6 months.

- Battery Appearance
 - No bulging, cracks, damage, leakage or corrosion.
- Battery Performance
 - a. Power on the system by using the AC adapter to fully charge the battery.
 - b. Disconnect the system from the AC adapter to power on the system by the battery until the system automatically shuts down.
 - c. The powering time of the battery indicates the battery performance. If the powering time of the battery is much shorter than 30 minutes, you should replace the battery or contact Service Department of the manufacturer.

3. Mechanical Safety

- Appearance of the system enclosure
- Appearance of the control panel

NOTE:

The surfaces of the control panel may be abrasive because of the split liquid or other cleaning spray. Take care to find the potential problem when performing the maintenance checks.

- Connectivity of interfaces

4. Image Recording

- Images in each mode
- Image recording using the standard probe

13.3 Troubleshooting

A1: The ultrasound system cannot be started up.

Q1: Check whether the battery capacity is exhausted, the ultrasound system is connected to the mains supply, or the main power button is pressed down.

A2: No images are displayed on the LCD monitor.

Q2: Check whether the power supply cable and video cable are well connected.

A3: The LCD monitor displays abnormal.

Q3: Check whether you select an appropriate probe and compatible exam type, or optimize imaging parameters correctly. For details, refer to Chapter 6 Acquiring Images.

A4: The measurement cannot be performed after selecting the **Calc** key on the control panel.

Q4: Ensure you pressing the **Calc** key in the frozen mode.

If the above problems still exist, please contact Customer Service Department of the manufacturer for help.

13.4 Equipment Disposal

You should dispose of the main unit, the probe, the biopsy bracket or other accessories in accordance with the local laws or regulations.

For the detailed disposal information, consult the manufacturer or the local distribution. The manufacturer is not responsible for any system content or accessories that have been discarded improperly.

13.5 Customer Service

Only the service personnel of or authorized by the manufacturer can service the ultrasound system. Any feedbacks or inquiries concerning our product or service should be directed to the following address.

Address: Yizhe Building, Yuquan Road, Nanshan, Shenzhen, P.R. China

Zip Code: 518051

Tel: +86-755-26722890

Fax: +86-755-26722850

E-mail: service@sonoscape.net

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Appendix A Specifications

Comply with	EN 60601-1 (IEC 60601-1), Medical electrical equipment Part 1: General requirements for basic safety and essential performance, Class I, BF, continuous operation EN 60601-2-37:2008 (IEC 60601-2-37:2007), Medical Electrical Equipment Part 2-37: Particular Requirements for the Basic Safety and Essential Performance of Ultrasonic Medical Diagnostic and Monitoring Equipment EN 60601-1-2:2007 (IEC 60601-1-2: 2007), Class A		
Classifications	Type of protection against electric shock	Class I	
	Degree of protection against electric shock	Type-BF applied part	
	Installation Type	Mobile equipment	
	Degrees of protection against harmful liquid	System is IPX0 Probe (from the acoustic window to the junction line) is IPX7 Footswitch is IPX2	
	According to the degree of safety of application	The equipment is not suitable for use in the presence of a flammable anesthetic mixture with air, oxygen or nitrous oxide.	
Environmental Requirement		Operations	Storage and Transportation
	Ambient Temperature	30%~85% (no condensation)	20%~90% (no condensation)
	Relative Humidity	10°C~+40°C	-20°C~+55°C
	Atmospheric Pressure	700hPa~1060hPa	700hPa~1060hPa
Power Supply	Voltage: 110-240V~ Frequency: 50/60Hz Power consumption: 110-240V~, 2.7-1.2A		

Appendix B EMC Guidance and Manufacturer's Declaration

B.1 Electromagnetic Emissions

The equipment is intended for use in the electromagnetic environment specified below. The customer or the user of the EQUIPMENT should assure that it is used in such an environment.


Emissions Test	Compliance	Electromagnetic Environment and Guidance
RF emissions CISPR 11	Group 1	The equipment uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The equipment is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

B. 2 Electromagnetic Immunity

The equipment is intended for use in the electromagnetic environment specified below. The customer or the user of the equipment should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment and Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV Contact ±8 kV Air	±6 kV Contact ±8 kV Air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines; ±1 kV for input/output lines	±2 kV for power supply lines; ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV line to line ±2 kV line to earth	±1 kV line to line ±2 kV line to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips and Short interruptions IEC 61000-4-11	<5 % U_T (>95 % dip in U_T) for 0.5 period 40 % U_T (60 % dip in U_T) for 5 periods 70 % U_T (30 % dip in U_T) for 25 periods <5 % U_T (>95 % dip in U_T) for 250 periods	<5 % U_T (>95 % dip in U_T) for 0.5 period 40 % U_T (60 % dip in U_T) for 5 periods 70 % U_T (30 % dip in U_T) for 25 periods 25 periods <5 % U_T (>95 % dip in U_T) for 250 periods	Mains power quality should be that of a typical commercial or hospital environment. If the user of the equipment requires continued operation during power mains interruptions, it is recommended for the equipment to be powered from an uninterrupted power supply.
Power frequency (50/60Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the AC mains voltage prior to application of the test level.			

The equipment is intended for use in the electromagnetic environment specified below. The customer or the user of the equipment should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment and Guidance
Conducted RF IEC 61000-4-6	3Vrms 150kHz-80 MHz	1 Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the EQUIPMENT, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.
Radiated RF IEC 61000-4-3	3V/m 80 MHz-2.5GHz	3 Vrms	<p>Recommended separation distance:</p> $d = 3.5 \sqrt{P}$ $d = 1.2 \sqrt{P} \quad 80\text{MHz}-800 \text{ MHz}$ $d = 2.3 \sqrt{P} \quad 80 \text{ MHz}-2.5\text{GHz}$ <p>Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,^a should be less than the compliance level in each frequency range. ^b Interference may occur in the vicinity of equipment marked with the following symbol:</p> 

NOTE 1: At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

^a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the EQUIPMENT is used exceeds the applicable RF compliance level above, the EQUIPMENT should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the EQUIPMENT.

^b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

B. 3 Recommended Separation Distances between Portable and Mobile and RF Communications Equipment and the Equipment

The equipment is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the equipment can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the equipment as recommended below, according to the maximum output power of the communications equipment.

Rated Maximum Output Power of Transmitter W	Separation distance according to frequency of transmitter m		
	150 kHz to 80 MHz $d = 1.2 \sqrt{P}$	80 MHz to 800 MHz $d = 1.2 \sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3 \sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.			
NOTE 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.			
NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

Appendix C Acoustic Output Data

Please consult the accompanying CD.